

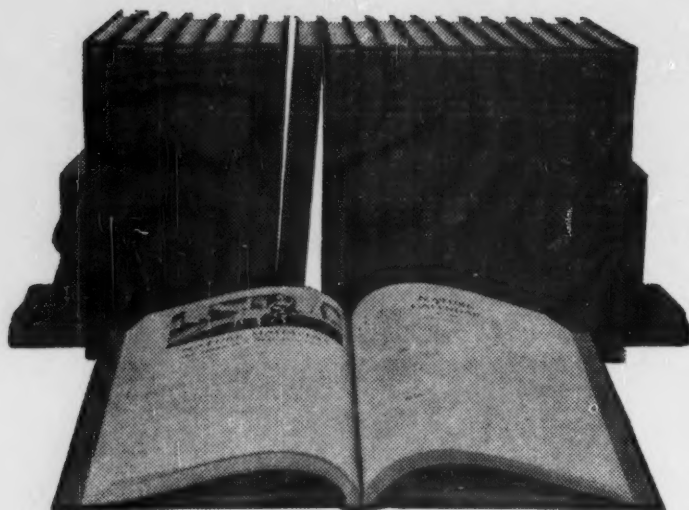
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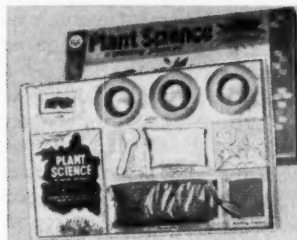
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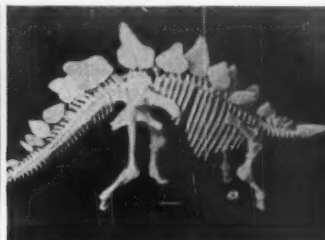
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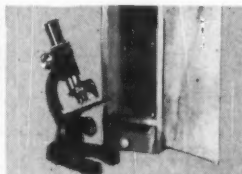
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Letters

MR. HARRY E. RADCLIFFE
VICE-PRESIDENT,
AMERICAN NATURE ASSOCIATION
WASHINGTON, D. C.

DEAR SIR:

Were I of sound mind, I would demand cancellation of my membership in the A.N.A., and I will tell you why.

I live right in the middle of American Nature out here on Green Valley Farm. I have always been kind to birds and animals, let brush grow on part of my pasture land, dammed the creek to make a swimming pool for muskrats, feed the rascals all winter. What happens to me?

A family of moronic screech owls call each other names in the maple trees outside my window. Then, about sunrise, when I wish to sleep just a little longer, five hundred grackles in the pine trees argue in muted tones. The dam in the creek didn't suit the muskrats, so they dug holes under it and away went a lot of time and effort. A family of foxes ate up some of my Leghorn pullets, and the raccoons got into my tomatoes and sweet corn. However, they were kind enough to leave me the stalks and vines. A young blue jay, who thought he was part of the jet age, broke a large plate glass window and I had to nurse him for a week, as he had a slight concussion. I felt like wringing his neck, but couldn't do it. Cost of a new window, \$19.37.

I have several large toads and spotted adder snakes that think I keep a concrete walk for bathing in the sun. Cats arch their backs, children and women scream, and pups stretch out at a safe distance and yap. I gather snakes and toads in a gunny-sack and give them free transportation to a stone pile half a mile away. They are all back in a week and I have to do the job over again.

Last winter I came across a half-grown 'possum in the corn field; a wet snow had chilled him badly. I took him to the house and put him in the cob basket by the kitchen stove. I forgot to tell my wife. She reached into the basket and grasped a smooth tail which she dropped and went for the great outdoors. She forgot to open the kitchen door, and took it with her. Cost of a new door, \$22.50.

Then there was the case of the downy woodpecker. Either he has a weak mind, or I have. He shows up as a winter resident—many downies do—but this one will take a grain of corn in his bill, fly up on the side of a basswood tree, hit it a few raps with his bill, and then swallow the corn. I had been led to believe that grubs were the only diet of this bird. How wrong I was.

Now you can see, Mr. Radcliffe, that Nature keeps me broke most of the time, and five grandchildren take care of the rest. I believe I still have five dollars left in the bank, so being a soft touch in any matter having to do with Nature I hereby remit.

Very respectfully,
Nathan Fleming

Chairman, La Salle County Conservation
Committee Board of Supervisors
MARSEILLES, ILLINOIS.

Reviews

A Course of Selected Reading

Science, Biology, Published by the International University Society, London. Sole distributor in the United States, Collings, Inc., 507 Fifth Avenue, New York 17, N. Y. Each volume \$4.50.

These two volumes, necessarily considered together, contain carefully selected readings chosen from authorities. The aim is to demonstrate the fundamental unity of all living things and the upward striving process of evolution. Descriptive brochures are available from the distributors in this country.

Conservation of Natural Resources

Edited by Guy-Harold Smith. New York. 1958. John Wiley and Sons. 474 pages. Illustrated. \$8.50.

This is a second and revised edition of this conservation textbook to which nineteen specialists in various fields of conservation have contributed. The first edition was published in 1950. In the relatively few years that have elapsed since that time there has been change, some for the better, some questionable. Basically, of course, the data and the history in this textbook remain constant.

Greenwood Summer

By Marjory Bartlett Sanger. New York. 1958. E. P. Dutton Company. 160 pages. Illustrated by Christine Price. \$2.95.

This story for young readers in the eight to twelve age brackets provides an interesting and effective approach to the study of Nature. Camp Greenwood is a Nature Camp, and Cousin Laura presents to Brian and Jenny Vogel, as a Christmas gift, a month's stay at the camp. The children were, at first, not too eager to go, but the month proves all too short and the experiences at the camp thoroughly fascinating. A section of Nature Notes at the conclusion of the story enables the reader to do some exploring similar to that of the youngsters in this story.

700 Science Experiments for Everyone

Compiled by UNESCO. New York. 1958. Doubleday and Company. 223 pages. Illustrated. \$3.00.

Originally published by UNESCO, as a source book for science teaching, this compilation of safe and exciting

experiments has been made by an international board of science experts. The experiments are interesting, instructive and simply enough presented to be used by the average youngster. A number of suggestions bear upon basic conservation teaching, also.

Water and the Cycle of Life

By Joseph A. Cocannouer. New York. 1958. Devin-Adair. 143 pages. \$3.00.

"One of our greatest needs in America today," says Dr. Cocannouer in his introduction to this valuable little book, "is not merely more water; our chief need is quality water for human consumption. Therefore, the theme of this book is quality water and the means of obtaining it. Only when we abide by the laws of nature's own water pattern is quality water possible. The aim of this book is to chart nature's straight and narrow road to her zones of conditioned, quality water." Much of late has been written about water and our vital needs in connection with it. Not enough attention has been paid to its quality. Thus this book has particular significance.

Tropical Fish in Your Home

By Herbert R. Axelrad and William Vorderwinkler. New York. 1958. Sterling Publishing Co. 144 pages. Illustrated in color and black and white. \$2.95.

This concise and comprehensive little book on one of the country's most popular and sustaining hobbies is now published in a new and revised edition. The authors are editors of a tropical fish magazine, and they have slanted the book both for the new hobbyist and the practicing aquarium fish keeper.

Briefly Noted

Ancient Elephants. By William E. Scheele. Cleveland and New York. 1958. World Publishing Company. 64 pages. Illustrated by the author. \$2.50. Introducing the younger reader to mastodons and mammoths.

Whitetail. By Rutherford G. Montgomery. Cleveland and New York. 1958. World Publishing Company. 64 pages. Illustrated by Marie Nonnast. \$2.50. A story about the prairie dog for the younger reader.

Little Red Newt. By Louise Dyer Harris and Norman Dyer Harris. Boston. 1958. Little, Brown and Company. 57 pages. Illustrated by Henry B. Kane. \$2.75. A lively story about the red newt and his ways of life.

Tan's Fish. By Ruthven Todd. Boston. 1958. Little, Brown and Company. 58 pages. Illustrated by Theresa Sherman. \$2.75. Charming story of a little Cantonese boy and the fish he found.

The Little Lost Goat. By Bessie Clem. New York. 1958. Greenwich Book Publishers. Illustrated by Eddy Jay. \$2.00. A story for children six to nine about a family in the Ozarks.

Man's World of Sound. By John R. Pierce and Edward E. David, Jr. New York. 1958. Doubleday and Company. 287 pages. \$5.00. Two research scientists with the Bell Telephone Laboratories explore the science of human sound in its entirety.

American Planning and Civic Annual. Edited by Harlean James and Dora A. Padgett. Washington, D. C. 1958. American Planning and Civic Association. 220 pages. \$3.00. A record of civic advance in the fields of planning, parks, housing, neighborhood improvement and conservation of natural resources.

Other Worlds in Space. By Terry Maloney. New York. 1958. Sterling Publishing Co. 128 pages. Illustrated by the author. \$2.95. What is currently known about outer space and what we are seeking to discover there.

The Aztec: Man and Tribe. By Victor W. Von Hagen. New York. 1958. New American Library. 222 pages. Fifty cents. History of the Aztecs in popular treatment.

They Wanted the Real Answers. By Amabel Williams-Ellis. New York. 1958. G. P. Putnam's Sons. 64 pages. Illustrated by Robert Engle. \$2.00. A "Science Explorer Book" for younger readers telling the stories of Edison, Aristotle, Pasteur and Darwin.

Bulletins

"Adventures in Science at the Smithsonian," by E. John Long and George Wiener, tells the reader about "a few of the scientific milestones that have marked the progress of civilization," and which are to be seen at the Smithsonian Institution in Washington, D. C. A peek at a few of the fields of science to be explored at the fabulous Smithsonian Institution, (Washington 25, D. C., where the brochure is available for 25c) presented in modern format and tasteful color.

"Protecting Dedicated Areas From Encroachment" is information bulletin 27 of the Nature Conservancy, 4200 22nd Street N. E., Washington, D. C., and consists of a special series of articles that has appeared in the magazine *Recreation* discussing the defense of park and recreation lands against encroachment for highway, subdivision, and other non-conforming uses. Included is a list of actions that may be taken by park and recreation authorities in defense of dedicated lands.

"Biology of the Great Plains Muskrat in Nebraska" should prove of interest to the biologist-specialist, and is the report of a study to secure basic biological information on the Great Plains muskrat in north-central Nebraska. This monograph, by J. Henry Sather, may be obtained from the secretary of the Wildlife Society, Dr. Joseph P. Linduska, Remington Farms, Chestertown, Maryland, for fifty cents.

"Distribution of the Black Duck," circular 51 of the U. S. Fish and Wildlife Service, outlines the American distribution, breeding, numbers, and wintering grounds of *Anas rubripes*, the black duck. From Superintendent of Documents, Washington 25, D. C., fifteen cents, illustrated and with references.

"Watersheds in Kansas" is Vol. 5, number 1 of the "Kansas School Naturalist," and contains a wealth of information concerning the use and abuse of watersheds, whether in Kansas or any other State. This bulletin also contains a good bibliography on general Nature subjects. It is free to citizens of Kansas; others may send inquiries to Kansas State Teachers College, Emporia, Kansas.

"Cone and Seed Insects of Western Forest Trees" is Technical Bulletin 1169 of the U. S. Department of Agriculture, written by F. P. Keen of the California Forest and Range Experimental Station of the Forest Service, and is a resume of research on cone and seed insect injury by western host trees, with keys to recognition of both damage and insects. A hundred and sixty-eight pages, illustrated, and with bibliography of reference books and bulletins of interest to the forester dealing with this general area. From the Superintendent of Documents, Washington 25, D. C., twenty-five cents.



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Reviews

The Rainbow Book of Nature

By Donald Culross Peattie. Cleveland and New York. 1958. The World Publishing Company. 320 pages. Illustrated in color and black and white by Rudolph Freund. \$4.95.

This is a lovely book, textually, physically and pictorially. Its audience is the boy or girl who is interested in Nature, or who, by geography, finds his interest thwarted by city life. Mr. Peattie's accomplished prose takes the young reader on many an outdoor adventure and introduces him to a wide variety of creatures and objects of the wild world. It does not profess, of course, to be a complete natural history. Instead it should stimulate an enthusiasm for more and more investigation of Nature in other books and in fact. This is a happy collaboration of writer and artist.

Gypsy in Verse.

By J. A. Allard. New York. 1958. Exposition Press. 64 pages. \$2.50.

The author, although for more than three decades a superintendent of schools, shares with us, in this brief book of expressive verse, his deep appreciation for Nature, along with bits of philosophy and humor garnered from what seems to us to be a wholehearted receptiveness to life.

R.B.

A Parent's Guide to Children's Reading

By Nancy Larrick. New York. 1958. Published simultaneously in a hard-cover edition by Doubleday and Company (\$2.95), and in paperback edition by Pocket Books, Inc., (\$.35).

This book, in both its manifestations, is sponsored by the National Book Committee, Inc., and its author is past president of the International Reading Association. The title is moderately descriptive of the contents of the book, which is an aid to the parent in guiding and stimulating his children's reading habits and scope. The advice is presented in friendly and practical fashion and the reasons for various suggestions of approach and method are given. One excellent section of the book is devoted to a list of books of proven interest to the younger readers. This book should have great influence in furthering reading skills and in fostering good reading.



Mary L. Edwards

FEBRUARY'S AUTHORS

Robert C. Baur, of Norwalk, Connecticut, is a free-lance writer who likes to draw on Nature for stories that tell of the everyday, earthy things that have brought this country to the position it enjoys in today's world. Particularly of interest to Mr. Baur are subjects that involve native plants. Mary Louise Edwards is an Ann Arbor, Michigan, housewife with a keen interest in "promoting better public relations between the wild ani-



Robert C. Baur

mals and man." She is the author of "The Orphan Raccoons," a book recently published by Barton House of Ann Arbor, which has shown her to be a fine press agent for these intelligent mammals. . . Peggy Larson is the free-lance-writer wife of the curator of exhibits at the Arizona-Sonora Desert Museum in Tucson, Arizona, and a resident of that city. . . Bernard L. Gordon is a biology instructor at Rhode Island State College of Education, in Providence, and a writer on subjects ichthyological. . . John L. Hawkinson, whose diorama work started as a hobby, has variously been designer and manufacturer of ceramics, worker in educational and short-feature films (he was for five and a half years a partner of the late Grantland Rice) and free-lance industrial designer. Mr. Hawkinson, who was born in Syracuse, New York, has been a resident of Hartford and East Hartford, Connecticut for many years. . . Dorothy Sharp Carter is the wife of an officer in the Foreign Service of the United States, and has lived for most of the past twelve years in Central and South America; her "home" is the American Embassy in Asuncion, Paraguay, at the present time. . . Clara Hussong, of Green Bay, Wisconsin, has been writing Nature articles and newspaper features for more than twenty years, and will shortly have published a children's bird book as one of Simon and Schuster's "Golden Picture Book" series. . . Jesse C. Burt is a professor of history at the University of Tennessee, a book and article writer, and presently Base Educational Counselor at Sewart Air Force Base near Nashville. He is a resident of Nashville.

Briefly Noted

Hymenoptera of America North of Mexico. Washington, D. C. 1958. Superintendent of Documents, U. S. Government Printing Office. 305 pages. \$1.75. This is the first supplement to the Synoptic Catalog of North American Hymenoptera compiled by the Agricultural Research Service U.S.D.A., under the direction of Karl V. Krombein.

Review of the Parrotfishes. By Leonard P. Schultz. Washington, D. C. 1958. Smithsonian Institution. 143 pages, plus 27 plates. Available from the Superintendent of Documents, U. S. Government Printing Office, Washington, 25, D. C. for 75 cents. Review of the parrotfishes of the Family Scaridae by the Curator of Fishes, Smithsonian Institution, in order more correctly to identify and understand relationships.

Pedro in Donkeyland. By Clara Price. New York. 1958. Greenwich Book Publishers. \$2.00. Story of a little Mexican boy and the donkey he loved. For the young reader.

Out of Many Songs. By Stanton A. Coblentz. Mill Valley, California. 1958. The Wings Press. 112 pages. \$2.50. This new collection of poems by this able poet includes many of interest to Nature enthusiasts.

Angler's Guide to the Salt Water Game Fishes of the Atlantic and Pacific. By Edward C. Migdalski. New York. 1958. The Ronald Press Company. 506 pages. Illustrated. \$7.50. Not just a book on fishing but a guide to the fishes as well.

Miniature Schnauzer. By Leda B. Martin and Sara M. Barbaresi. New York. 1958. Sterling Publishing Co. 64 pages. Illustrated. \$2.00. How to raise and train dogs of this breed.

George Washington Carver. By Henry Thomas. New York. 1958. G. P. Putnam's Sons. 126 pages. Illustrated by André Le Blanc. \$2.00. Biography of the great Negro scientist for younger readers.

Think, Mr. Platypus. By Anita Hewett. New York. 1958. Sterling Publishing Co. 32 pages. Illustrated by Anne Marie Jaus. \$2.50. Story of the platypus for the quite young reader.

Checklist of the Millipeds of North America. By Ralph V. Chamberlin and Richard K. Hoffman. Washington, D. C. 1958. Smithsonian Institution. 236 pages. Available from the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C. \$1.00. An up-to-date checklist that recognizes the additions and changes in classification in this area.

Contents

noted BY THE EDITOR

"PENALTY OF DEMOCRACY" is a phrase now and then cited to explain—even excuse—some of the contradictions that so often crop up in governmental administration. No doubt it would shruggingly be applied to what seems fated to happen to forests on Bureau of Land Management lands in the State of Alaska. Facing the threat of disastrous forest fires on these almost totally unprotected acres, conservationists joined to urge appropriation to provide for fire-fighting. A quarter-million dollars were appropriated and, thanks to this and a break in the weather, damage was held to a minimum. These funds made it possible to establish a fire-protection facility as guarantee for the future. Now rumor has it that the Bureau of the Budget has turned thumbs down on any appropriation whatsoever for the coming fiscal year, thus abandoning the physical plant that has been set up. It is like spending a lot of money to tool up a fine, sleek automobile model and then leaving out the engine.

CONSERVATION'S GAINS OR LOSSES IN THE 86TH CONGRESS are not yet completely assessable. No doubt there are members of the new Congress not well informed on conservation issues, as well as others who have a good background in our field of interest. It is, no doubt, coincidence, but it is interesting to note that none of the many sponsors of the Wilderness Bill, whether Senator or Representative, Republican or Democrat, male or female, failed to return to the 86th Congress. On the other hand, some of the most active opponents of this legislation fell by the wayside in the last November election.

CITRUS IS A DIETARY RECOMMENDATION, and it is no less for birds than it is for humans, according to Thelma T. Connor, a Florida Audubon Society member. During the past winter, when there were so many fallen fruits, she tried cutting oranges and placing them on her bird feeders. Starting with a half-dozen oranges, she was soon putting out several pails full a day. Jays, mockers, woodpeckers, catbirds, thrushes, cardinals, sparrows and others eagerly cleaned every bit of flesh from the fruits. Even oranges juiced for breakfast still contain much

pulp of interest to the birds. This is worth remembering wherever one seeks to help birds through a hard winter. We doubt that any ornithological study has been made to determine the health significance of the citrus vitamin in avian diet, but it seems reasonable to assume that, if it benefits humans, it must be good for birds, too.

THE INTERNATIONAL UNION FOR CONSERVATION, meeting in Athens, Greece, for its Sixth General Assembly, devoted particular attention to the international aspects of National Parks and Reserves. Resolutions urged that the United Nations establish and maintain a world list of parks and equivalent reserves; that immediate steps be taken to protect Mt. Olympus in Greece as a park; that a special conference on national parks from the international viewpoint be convened soon. Jean G. Baer of Switzerland was elected president of the Union, and Harold J. Coolidge of the National Research Council was elected a vice-president. Dr. Edward H. Graham of the U. S. Soil Conservation Service was elected to the Executive Board.

MASS SPRAYING FOR GRASSHOPPER CONTROL was carried on in northern Colorado last summer. It was a State program and one of those shotgun affairs that ignore the numerous side effects of such sprayings. Indeed, some State officials contended that the grasshopper threat was exaggerated. However, one agriculture instructor at Colorado State University was so bold as to differ in writing with the program. He pointed to the destruction of bees and other important pollinating insects as a disastrous result of the spraying. Since he had the effrontery to differ with the powers-that-are, pressure was brought to cause his resignation. This is a dangerous compromising of academic and scientific freedom. Unfortunately it is typical of the attitude prevailing in Federal bureaucracy as well as State. Men who privately take exception to the widespread and varied poison programs dare not speak out for fear of their jobs. This is a most unhealthy situation and a frustrating one. Indeed, we have never encountered anything quite equalling the smugness of the bureaucrats when one has the temerity to question the wisdom of their policies.

R.W.W.

*A changing economy may doom
the seed catalog, so long a*

Preview of Spring

By ROBERT C. BAUR

Photographs by the Author

Woven into the historical fabric of America is the seed catalog, harbinger of spring, a publication that has played its part in making the American table the most bountifully supplied of any in the world.



THE proverbial signs of spring are many and varied, but few provide more pleasure than the seed catalog. Inspiring generations of winter-weary husbandmen, this mail-order bit of Americana is brightly woven into our historical fabric. Brought to our shores along with *The Bible*, flower seeds were family treasures to be cherished by the next of kin, and records indicate that seeds were first sold in milliner's shops!

Forerunners of the seed catalog were the advertisements that appeared in colonial newspapers. Evan Davies was offering "fresh garden seed of all sorts, imported from London," in the 1719 *Boston Gazette*. Other seed advertisements appeared in the Philadelphia and New York papers. A seed list published in a Boston newspaper in 1760 included many of our present-day flower favorites. The fine postal system established by Benjamin Franklin enabled nurserymen to publish their seed lists along the entire Atlantic seaboard.

One of the earliest commercial nurseries in America, known as the Linnaean Botanic Garden, was started around 1730 by William Prince in Flushing, Long Island. Advertisements in *The New York*

Mercury, in 1774, extolled Carolina magnolia trees as the most beautiful trees that grew in America, and catalpa trees that were as thick as one's leg.

When the British took Flushing during the Revolution, General Howe placed a guard around the nursery to protect its botanical treasures. Business was slow during the war, but British officers are said to have purchased native shrubs to send home.

Prince nursery catalogs listing every hardy variety of fruit tree known to European and American gardeners were highly prized. The first Prince catalog, printed in 1791, was actually an eighteen-by-twenty-four-inch broadside. Thomas Jefferson was numbered among Prince's clients, and purchased sugar maples in 1791. Jefferson's other selections during the same year included roses, rhododendrons, hemlocks and fruit trees.

By 1822, the Prince catalog listed nearly 3000 plants. The 1827 catalog was an unornamented botanical price list. Grouped in four plant categories, native species were especially popular with European gardeners, and catalpas and sugar maples sold for fifteen dollars the hundred, flowering dogwoods at twenty cents each. Ferns comprised a collection that the proprietor hoped would include every known American species. As New York had regular packet service with domestic and foreign ports, Prince nursery stock was shipped everywhere, remittance being made by draft on cities scattered from Portland to New Orleans.

Flourishing for four generations as a family enterprise, the Princes pioneered with western wildflowers, and many were gathered by Robert William Prince himself, in the California gold fields. Not to be confused with

William Prince's business was the Old American Nursery, also at Flushing, operated by Benjamin Prince and Stephen Mills. In 1822, a catalog describing the tulip poplar as the most ornamental tree offered the public sassafras, sugar maple, umbrella magnolia, and the scarlet-fruited winterberry.

Fruit tree scions for grafting were priced at fifty cents a dozen. Apple trees sold for thirty-seven and a half cents, with Red Sweeting, Harrison's Celebrated Newark, Hughe's Red Virginia Crab, and Herefordshire Red Streak being especially recommended for cider.

A nursery for the commercial growing of seed was established in Philadelphia by D. and C. Landreth in 1784. Their collection of camellias and rhododendrons was one of the earliest in America, and they grew the first cantaloupes from seed imported from Tripoli. However,

the Landreths are best remembered for *The Floral Magazine and Botanical Repository*, which is considered an outstanding example of early American flower lithography. This volume, published in 1832, was the first American seed catalog embellished with colored illustrations. Thirty hand-colored lithographs by prominent con-

temporary artists included the rhododendron, camellia, magnolia, passion flower, hyacinth, begonia and gloxinia. The frontispiece was engraved with a vignette of Landreth's greenhouse.

Another Philadelphia seedsman, Bernard McMahon, printed a catalog in 1804, listing a thousand species of herbs, shrubs and tree seeds; many of these were native plants offered for the export trade. Thomas Jefferson recommended McMahon to care for the botanical treasures collected by the Lewis and Clark Expedition. As a precautionary measure, seed also was given to William Hamilton and other growers. McMahon kept Jefferson informed on the progress of the plants, later engaging the botanist Frederick Pursh to name the new discoveries. Lewis's untimely death caused McMahon considerable concern over the plants entrusted to his care. In 1813, Jefferson directed McMahon to make a collection of these western plants for his friend Thöüin, of the national garden of Paris.

By 1822, the Prince-Mills catalog listed Lewis's famous fragrant yellow-flowering currant from the western country. Grant Thorburn advertised *Clarkia pulchella* for six cents a paper in 1832. *Clarkia* and blue flax are current catalog favorites gathered on the historic westward journey. McMahon died in 1815, but he is remembered in nursery catalogs today by the *Mahonia*, or Oregon holly-grape, named after the pioneer seedsman by Thomas Nuttall.

Another catalog of interest was that of Thomas Hogg, of New York City. Hogg's florist's establishment—at what is now Broadway and Twenty-third Street—attracted considerable attention. Greenhouses were a

THE LIGHTED WAY

*The way is dark from winter into spring,
And seeds, like children, need a candle's glowing,
Forsythia and daffodils bloom first,
So other seeds can see where they are going.*

Bessie F. Collins

rarity in New York, and orchids and exotic plants made Hogg's collection one of the finest in the United States. His 1834 catalog was entitled, descriptively if not briefly, *Catalogue of Ornamental Trees and Shrubs, Herbaceous and Greenhouse Plants, Cultivated and Grown for Sale by Thomas Hogg, Nurseryman and Florist at the New York Botanic Garden in Broadway, near the House of Refuge*.

Possibly the earliest catalog reference to sweet corn may be traced to New York seedsman G. Thorburn and Son. Sugar-corn seed, best for boiling, sold for six cents an ear in 1822. A decade later, Thorburn's listed Early Golden Sioux, Canadian, Early Tuscarora, and Sweet Corn as the best kinds for table, providing they were



In the earlier days of the nation's history, homesick settlers were cheered by the catalogs of the territorial nurserymen. Familiar plant listings were welcome friends from "back home," and interspersed with plant offerings were instructions for the preparation of medicinal herbs and other remedies.

used when milk could be pressed from the seed. Planting instructions, patterned after the Indian method, concluded with the following suggestion: "Whether any genteeler mode will be discovered than that of gnawing at young ears of corn between the fingers, we leave to the sagacity of refined gastronomes." Although sweet corn was known to some inland Indian tribes, it did not become a popular catalog item until the Civil War period, when various hybrid strains were introduced.

Among the seed catalog's many virtues should be included the title of "cookbook," for it has contributed much to making the American table the most abundant in the world. Thorburn's 1832 catalog gave instruc-

tions for the culture of "au pomme d'amour," as well as recipes for tomato puree and pickles. A seed catalog without tempting tomato photographs seems inconceivable today, yet names like "Love Apple" and "Paradise Apple" recall the days when this popular vegetable was eyed as a suspicious ornamental.

Thorburn's catalogs list many gardening accessories. Crocus pots in the form of hedgehogs, beehives, flower baskets and shot-towers (for forcing crocus into indoor bloom) were in vogue in 1832. There were also pyramidal-shaped parsley pots, mignonette bowls, and hyacinth glasses.

Our forebears' enthusiasm for gardening is further indicated by the advertisements for children's rakes and transplanting scoops. Thorburn's customers also were buying asparagus knives, caterpillar brushes, mole traps, and ladies' weeding trowels.

Early catalogs not only supplied the housewife with medicinal herbs, but also gave drying instructions and remedies as well. Little wonder that the "Thorny Ash" found a market as the "toothache tree" where dentistry was a blacksmith's avocation. Hops were used for hot teas and poultices, as well as for yeast and brewing. The pole of the martin house provided ample climbing space for the family hop supply, while flax and gourds were other indispensable seed items in the homespun age.

Homesick settlers were cheered by the catalogs of early territorial nurserymen. Familiar plant listings were welcome friends from "back home." Colonel J. L. L. F. Warren, a Massachusetts nurseryman arriving in California with the "forty-niners," is responsible for Sacramento's first flower show. His 1853 catalog listed many bulbs, and an extensive rose collection. The 1848-49 catalog of William Walker, San Francisco attorney and nurseryman, indicates that Walker was among the first to sell Australian plants like the acacia and eucalyptus. Three kinds of eucalyptus were listed in 1858.

The post-Civil War period saw a revival of gardening enthusiasm, and seed houses and nurseries flourished during the eighteen-seventies. The trend was toward flowers and landscaping, for newly patented conveniences were creating more leisure time for gardening. Egg money was carefully hoarded pending the arrival of the seed peddler. Some horse-and-buggy agents threw in a flowering shrub with every purchase of a dozen fruit trees.

As the nation expanded, vendors could not keep pace with the population. Consequently, seed advertisements bloomed in periodicals everywhere, inviting readers to send for catalogs. All the wonders of summertime could be enjoyed for the price of a postage stamp! Trade names like W. Atlee Burpee, Henry Dreer, Peter Hender-

son, Vaughans, James Vick, D. M. Ferry and R. H. Shumway became bywords with spring and planting time.

R. H. Shumway, of Rockford, Illinois, issued his first seed catalog in 1870. Four thousand copies of this sixteen-page book were printed. Hand-packaged seed was sold in plain kraft bags stamped with the firm's name, address, and cultural instructions. Shumway's handsome eighty-ninth catalog edition, illustrated with many old-fashioned cuts, has preserved the flavor of earlier catalogs.

In 1879, W. Atlee Burpee, Philadelphia land and livestock dealer, began listing farm and garden seed in his sixteen-page catalog. Illustrated with wooden cuts, the book known as *Burpee's Farm Annual* was increased to forty pages the following spring. Selling at five cents a packet, 341 varieties of flower seeds were offered.

Lithographed color plates of a tomato and differently colored single dahlias were used for the first time in the 1884 catalog, which by now numbered 120 pages. By 1886, both front and back cover appeared in color. The 1890 Burpee catalog introduced the bush lima bean, the only bush form of the true large lima bean to date. Specializing in sweet peas, *Burpee's* listed forty-three distinct varieties in 1894.

The establishment of the rural free delivery in 1896 brought the seed catalog to the remotest dwelling. Catalogs of the nineties decorated with plump-cheeked cherubs in fruit- and flower-garnished bowers were frivolous as period Valentines.

The Jackson and Perkins Company has made Newark, New York, the rose capital of the world. More than 2,000,000 copies of its colorful rose catalog were printed last year; although Jackson and Perkins originated as a wholesale house in 1872, its first retail catalog did not appear until 1938. Through the years, Jackson and Perkins' best catalog seller has been the crimson hybrid tea *New Yorker*, with *Blaze* and *Summer Snow* topping the list of climbing roses offered to the public.

Half of the plant patents issued since the passing of the Plant Patent Act have been for roses, making this plant an all-time catalog favorite. John Josselyn reported English roses growing pleasantly in Massachusetts gardens fifty years after the landing of the Pilgrims. These pioneer roses were probably the "Sweetbrier" or "Eglantine." Catalogs were selling "Cinnamon" and "Sweetbrier roses" for twenty-five cents in the eighteenth century. Michael Floy & Sons, of New York, offered a selection of 200 roses in their 1832 catalog. By 1844, the Prince Nursery catalog listed 584 rose varieties.

Superlative printing and excellent photos have contributed to the popularity of the Wayside Gardens cata-

log. A comparative newcomer in catalog history, the Wayside book appeared in 1921 as a bulb circular and two thirty-two page wholesale and retail catalogs.

The seed catalog has conformed to the times in a versatile manner. Cover illustrations featuring vegetables aided the war efforts in 1918 and 1943. Due to paper restrictions, the number of pages was reduced, and in the second world war the friendly Dutch bulbs were missing. When gardening returned to a peacetime basis, flowers bloomed on fat catalog covers again. Foremost in publishing plant discoveries, the seed catalog has announced the first crack-resistant tomato and seedless watermelon. As a discriminate "who's who," botanical



Gardening accessories offered in spring seed catalogs of earlier days included parsley pots, mignonette bowls and hyacinth glasses. Early enthusiasm for gardening is also indicated by the advertisements of children's rakes, transplanting scoops, asparagus knives, caterpillar brushes and mole traps.

names on its pages have honored outstanding personalities from George Washington to President Eisenhower.

Increased postal rates, printing costs and the number of individual stores selling seed and gardening supplies are threatening the existence of the seed catalog. Regrettably, the planting season is no longer heralded by the familiar catalogs of Henry Dreer and Peter Henderson. Many small seed houses are finding it necessary to merge with larger concerns.

Fortunately, our heritage of seed catalogs is being preserved by such foundations as the Liberty Hyde Bailey Hortorium at Cornell University; the United States Department of Agriculture Library; the Massa-

chusetts Horticultural Society, and the Rancho Santa Ana Botanic Garden of Claremont, California. In the interest of scientific research, present and future, persons having early catalogs in their possession are invited to preserve them for posterity by contributing them to these institutions, where they will be safe and useful.

The Gadabout Limpet

By MYRON R. KIRSCH

Photograph by the Author

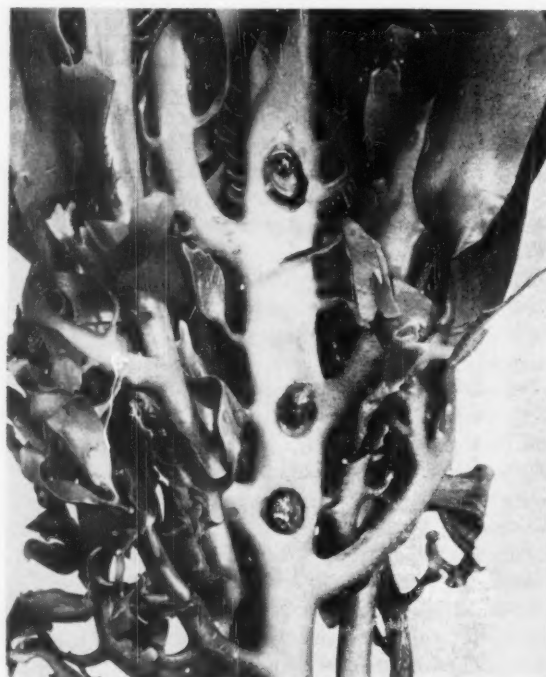
A LONG THE coast of western North America, from Alaska to Lower California, may be found an intriguing little mollusk, the "seaweed limpet," *Acmaea inessa*. It is of special interest for two reasons. First, it is apparently limited ecologically to the flat, leathery midribs of the brown seaweeds, *Egregia menziesii* and its close relative *E. australis*, which grow profusely in the coastal waters. Secondly, it exhibits what some naturalists have interpreted as a remarkable homing instinct.

The seaweed limpet is a small gastropod, averaging about five-eighths of an inch in length, a little less than that in width, and about three-eighths of an inch in height at the apex. The shell is dark brownish topside and underside, rather smooth, and shiny. The sides are somewhat flattened and the top or apex is high. A major distinguishing characteristic, although none other than the restricted habitat is really necessary, is the white marking on the apex of the shell. One usually finds three and often four such markings, with the central one being the largest.

Acmaea inessa is not the only limpet whose ecological niche is restricted to the stalk of a marine plant. It is, however, one of the more familiar species in the coastal waters of western North America. In these waters one may also find *Acmaea instabilis* living on a brown alga, *Laminaria andersonii*, *A. paleacea* limited to the blades of the eel grass, *Phyllospadix torreyi*, and *A. triangularis* feeding exclusively on a coralline alga.

Of greater significance and interest, perhaps, is the apparent homing characteristic of *Acmaea inessa* and other limpets. For centuries naturalists have observed and studied the curious, snail-like wanderings of limpets, noting that some species seem to return to a specific site after having foraged for food. Aristotle, presumably, was the first observer to record such limpet behavior.

You may call the seed catalog a well-schemed "silent salesman" if you will. As the first sign of spring, this book of wonders knows no equal. Encyclopedia, cookbook and one-time medical guide, its colorful pages are the history of a pioneer people who were able to find time for lilacs, lilies and phlox!



The seaweed limpet, *Acmaea inessa*, roams the stalk of the brown seaweed *Egregia australis* and eventually returns to the site from which it started, exhibiting what some naturalists have interpreted as a remarkable homing instinct.

Up to the nineteenth century, it was considered an established fact that certain limpets possessed a homing instinct. Early in the nineteenth century, however, investigators began to express some doubt. Observations were less conclusive. Later reports, based upon more accurate scientific investigation, tended to negate the homing concept. Yet, some limpets, like *Acmaea inessa*, leave their little niches in search of food only to return to the site whence they started. In the case of *A. inessa* this is no mean feat as the creature is oval and must, therefore, precisely orient itself to the shape of its niche. Note how well the three seaweed limpets shown in the accompanying photograph have accomplished this.

Is this peculiar behavior an expression of a true homing instinct, or is it just lucky trial and error behavior? No one really seems to know. But even if someone proves conclusively that it is or is not, the seaweed limpet will retain its status as a remarkable little creature.



A strange relic of the past was

Midge

By MARY LOUISE EDWARDS

Photographs by Talbot Studio

"She weighed less than two ounces, just fitted in the palm of my hand, and was covered with soft, dark silver-sheened fur."



IT WAS sunrise time on a day in late August when I found Midge. I had gone outdoors to put cracked grain and sunflower seeds for the birds on the wide porch railing. It has always been a pleasure to my husband and me to watch the early risers—the cardinals and bluejays and even the wary crows—as they hurry over to our feed rail, intent on eating as much breakfast as they can hold before the rest of the world wakes up.

When I had finished scattering the grain, I stood for a moment watching the changing colors of the sky and listening to the piping of a cricket frog. As I turned to go in I happened to glance down the steps and there, curled up at the very bottom, was something small and gray. I thought it was a mouse, a queer one with an oversized white head. I went down to investigate. Instead of a mouse, it was the tiniest opossum I had ever



"...here was Midge, hanging tight to my finger with her long prehensile tail..."

seen. She was about as big as a silver dollar. I thought she was dead, but when I picked her up there was no stiffness and I hurried her into the house and warmed a formula of condensed milk, water, egg yolk, and liquid vitamins to feed the infant. I put the heating pad on the side of the bed and carefully laid the opossum on it. In a few minutes a pinkness crept into the ball of a nose and into the perfectly formed toes—a pinkness that made them stand out in contrast to the darker fur that came down on the legs like dragging cuffs. As I watched, I could see little jerks of movement and I held the medicine dropper near her lips. Her eyes opened, her nose twitched, and I pressed the milk into her mouth.

Instantly the 'possum began a frantic nursing, and by the end of the feeding she was standing up on wobbly legs, a midget opossum, eager to explore her heating-pad world. Already I was calling her Midge.

We often had watched grown-up opossums shuffle slowly to our porch at evening time for the tidbits we put out to help Nature feed the mammals that forage for their livelihoods. Besides the opossums there were raccoons and doe-eyed flying squirrels and goblin-flight bats and others of the nighttime population. There were so many that we sometimes thought they came from alien woodlands to make their homes in our rugged and plentiful acres.

Opossums always seemed strange creatures to us, with little to recommend them except the fact that they were alive. There was something in their clumsy movements

and startlingly ugly heads that made us think of lost ages. We had read that when opossums are born they are so small it takes 270 of them to weigh an ounce. The whole marsupial process seemed like an incredible heritage from the past, bringing forth one of the wonders of life but certainly, in the case of the opossum, nothing that could be loved by humans. And yet, here was Midge, hanging tight to my finger with her long prehensile tail whenever I held my hand out to her, and always looking straight up at me with alert black eyes.

She weighed less than two ounces, just fitted in the palm of my hand, and was covered with soft, dark silver-sheened fur. Her long head was white with big, nearly transparent, fluted ears, somewhat as the angel-wing shell is fluted. The mouth was all out of proportion to the rest of the body. When she yawned, she appeared to be ninety percent "gap." There were numerous tiny white teeth, too small to count, but forty-eight or fifty if she followed the immemorial pattern for opossums. The tail was pink and had a thin covering of fine silky white hair. The front paws had five pink, sharp-clawed finger-like toes, with an open-fan symmetry about them. There were five toes on the hind feet, but the first toe was opposable, like the thumb of man and monkey, and it was clawless with a flat pad at the end. Her back legs had no knee joint between the ankle and body. The knee was way up where we thought the hip should be, which gave her the lumbering opossum-waddle. But there was nothing of the grown-up open-mouthed "be-ware of me, I'm mean" look about Midge.

Much of her waking time was spent in "slicking up." Midge was as fastidious as Tabby or any dainty deer mouse. She would sit up on her back legs and thoroughly lick her front paws, and then reach way back of her big ears, drawing her paws down tightly across the whiskers that sprouted profusely from two places on each side of her face. This effort almost always threw the little creature off balance, and she would topple over, then wiggle quickly upright to begin again. We had read that opossums were unclean and slovenly, but Midge was immaculate.

It is a mystery how Midge happened to be on our lowest step that August morning, but we think that perhaps she was starved out of her mother's pouch. Her brothers and sisters may have been larger than she, and more aggressive in their nursing until finally the hungry baby was pushed away. That she survived the night on the chill cement step speaks eloquently for the stamina



Appearances are sometimes deceptive. Midge is not kissing the author, but merely licking her lips in search of moisture.

The little opossum would chew on a light cord and play with a pencil or any other small object dropped in front of her.



of a species that has remained unchanged through the ages.

Bringing up young wild animals of any kind is a demanding undertaking. They require almost the same care that human children do. The previous year we had successfully raised two raccoons that we found in our yard before their eyes were open, and we felt prepared to bring up Midge. At night she slept on the heating pad by my side, and every two or three hours she would crawl up under my chin and hunt for dinner. If I failed to awaken at once, Midge would creep to my mouth and lick my lips, trying to get moisture. My husband and I took turns fumbling our way to the bathroom to warm the formula, and Midge had a half to three-quarters of a medicine dropper-full at a time. Young wild mammals must be fed every three hours, night and day, and Midge was no exception.

For two days after we found her there were no signs of body functions, an indication of how close Midge had been to starvation. Finally, on an exploring trip, the

"My husband and I took turns fumbling our way to the bathroom to warm the formula, and Midge had a half to three-quarters of a medicine dropper-full at a time."

little opossum found a corner of the bathroom she liked, in back of the waste basket, and it was there that I spread papers. When Midge woke up from a nap, she would go straight to that corner, returning to the same spot time after time.

During the day, we kept the heating pad on the floor by the side of the bed so she could roam wherever she wanted to. She would peek into the closets, or behind the dresser, or under the ruffled chairs. Midge was so small that whenever we went into the bedroom we had to be careful not to step on her. Once, when I could not find her, I crawled around on the floor, looking under the furniture. Then I spoke her name and the minute Midge heard my voice she came hurrying out of the closet to me and seemed pleased to be picked up and cuddled.

Opossums are popularly supposed to be dull-witted animals, but many times I watched Midge make the trip from the heating pad to her corner in the bathroom and back again, and she would always go in a straight line, completely oriented to her strange new home. Her tiny legs moved with such unbelievably rapid precision that I was reminded of the mechanical toys that street vendors wind up and set to scurrying around the pavement.

Sometimes, during the day, Midge was restless and would not sleep long at a time. She would wake up and fuss with the soft rag that covered her, taking it in her mouth and pulling it over her if it slipped away. Or she would stand up and stretch, and then wander around the room from corner to corner, stopping to snuffle the shoes, or chew on a light cord, or play with a pencil or any small object I dropped in front of her. If I picked Midge up and wrapped her in flannelette and stuffed her down the front of my dress, she would be quiet and contented for hours at a time. In her mother's pouch she had been hidden and warm, and there may have been some memory of that security.

One evening we went to a restaurant for dinner, quite a distance from home. Not wanting to leave Midge behind for so long a time, I bundled her down the front



of my dress and off we went, with formula, medicine dropper and all. She slept soundly until the food was set before us, and then she began an excited wiggling. Midge was insisting on getting out for a sample. Thinking of the panic it would create if the head of a baby opossum suddenly peeked out under my chin, I kept one hand firmly on Midge while my husband cut my food for me, and we hurried with our dinner. We had Midge's formula in a small bottle that we warmed in the teapot while we were eating, and as soon as we had finished we took the squirming youngster to the car, where she could be fed without an audience.

It was on the thirteenth day after we had found her that trouble began, diagnosed by the veterinary as a bowel infection. Midge was listless and refused her food. I tried to give her the special diet that had been prescribed, but she refused to swallow. By the fourteenth day she was breathing heavily, and at times her nose would drain of its pinkness and become a chalky white, as it had been when I first found her. She would crawl shakily to my hand, and curl up there. Once she licked my finger with a dry tongue and looked up at my face, and I tried to give her water.

When I took Midge to the doctor again, he told me what I had already guessed—that she could not get well. She had been too weakened by early starvation to throw off illness. He gave her a shot of penicillin as a last hope, but Midge died in my hand on the way home. ♥

ELDER CITIZEN

*The heaviest storms he has braved, outpaced,
And tasted undaunted the salt, the sting;
His back, to the blizzard but lately braced,
Now sways relaxed to the grace of Spring.*

John F. Davidson



JACK DERMID

The Busiest Beachcomber

When fishing is good, laughing gulls soar for hours at a time on streamlined wings in their perpetual search for insects, worms, fish and crabs.

But their mask is a natural black hood that drops around the shoulders and stays there during the warm months. In cool weather, avian fashion decrees a plumage change from the slick, black sheen of summer to a nondescript mottled brown for winter. However changeable its costume, the laughing gull cares not a whit. Gulping a meal of fish is each day's prime goal, and to the amiable laughing gull, food is food, any kind, anywhere, at any time.

Getting it, however, is not always a laughing matter.

EVER SINCE men in ships began to ply the Atlantic coast, hundreds of unsuspecting vessels have slammed into disaster on the sand shoals off North Carolina's Outer Banks—a thin strand of lengthwise islands stretching for miles up and down land's end from historic Cape Hatteras.

While the beach at one time meant a haven to sailors whose ships had run aground, it has become today a relatively untrod sand-strip of rusting hulls, buried keels and the most debonair sea birds on the Atlantic shore. The pristine wilderness of that windswept beach has been captured unmarred, and preserved as Cape Hatteras National Seashore Recreational Area. Its trade-mark is the loud and laughable laughing gull.

To be sure, a gull is a gull. Yet it is hard to travel the vast expanse of sand, surf, and sea beyond Cape Hatteras without realizing that the laughing gull and its brethren are part owners of this sea-going real estate. And it seems clear that, as far as the birds are concerned, possession is nine points of the law. This they proclaim loudly and churlishly.

A point in their favor, at any rate, is that no gull is more coastal in habit. Sand-spits, inlets and sounds are "home, sweet home" to this seaside clown, and if it wings its way inland, once in a blue moon, it promptly speeds back to the sweet salt waters of the shore.

There, it is talkative to the extreme, yapping constantly at itself, the sea, or other gulls. Men compare its high-pitched squawks to bursts of laughter, which is not at all far-fetched, and hence the name.

Like the Lone Ranger, laughing gulls go masked.

Rain or shine, parent laughing gulls guard their nests meticulously, breeding on grassy islands and brackish marshes from Nova Scotia to Texas. Distinguishing marks are the black head, dark wingtips, and white-bordered trailing edges of the wings.

L. G. KESTELOO



By
ANN and MYRON SUTTON

*Photographs courtesy of Virginia Commission of Game and Inland Fisheries
and North Carolina Wildlife Resources Commission.*

These birds consume almost anything they can find—insects, worms, fish, crabs—and their table manners are atrocious. Any bird that snaps up a fish from the choppy surf must eat it quickly or lose it, for the brassy laughing gull comes in like a jabbering streak of lightning to wrest the catch from its neighbor. Nor is it above that ultimate skulduggery—outright thievery. Now and then a “laugher” alights on the head of a pelican just in the act of swallowing a fish, and abruptly relieves the startled bird of its meal. Rude or not, this culinary

Three eggs are the rule when laughing gulls decide to raise a family. The eggs are usually laid in June, and the speckled design is typical. Nests may be elaborately constructed, but on the other hand sometimes may consist of little more than a patch of grass or tide-drift.

L. G. KESTELOO



tour de force is a splendid way of filling a laughing gull's empty maw.

At Hatteras the bird leads a notoriously lazy existence by following the auto ferry to dive after fish that the boat churns up. But Hatteras and its ferry are by no means the only places where this gull goes into action. The cosmopolitan laughing gull is a confirmed hemispheric traveler, breeding from Maine to Venezuela and wintering from South Carolina to Brazil.

Noisy, nesting laughers take over numerous islands of coastal Virginia in May. They have colonized heavily on Muskeget Island, Massachusetts. They wing their way at random across mangrove waterways south of Florida's Everglades and out along the Keys. Where seas meet shores, there you will find the laughing gull.

There was a time, however, when these gregarious gulls were hard to find. Decades ago, persistent oystermen regularly raided gull colonies for eggs to augment their food supply, and by the eighteen-eighties the laughing gull was nearing extinction. Since then, common-sense laws and strong conservation efforts have brought the laugher back nearly to its former numbers.

To compete with its multitudinous kin, the laughing gull must become a gull of many voices. Its repertoire includes warning, nesting and flight calls, some tender groans, and a long, loud clear note uttered by the male when courting his bride-to-be. Besides singing with coy aggressiveness, he stretches his neck and snaps

This laughing gull hatchling, first of the clutch to peck its way into the outer world, sports a mottled brown coat, utterly unlike the black heads, gray wings and white vests of its elders. Its parents are good providers, and for a while it will live an easy life.

L. G. KESTELOO





W. H. MULLINS

The laughing gull is one of the most common sea birds on the Atlantic Coast. The colony above is located on Virginia's eastern shore, where the "laughers" take over many islands each May.

his head straight up with a vigorous, impassioned jerk.

That does it! Performing these antics often enough and sincerely enough finally wins over the female. The bridegroom, victorious, moans compassionately—in a way that only distaff laughing gulls could love—and brings his lady fresh fish tidbits from the sea. Then housekeeping begins.

Those members of the nesting colony lucky enough to find a suburban clump of sea oats or bayberry will enjoy a little privacy. Others, bound to community life, nest in the open, their quarters a frugal nest-platform of reeds or tide drift, with shredded beach grass for an interior trim. Building this summer home calls for a sharp division of labor. To the male goes the task of gathering reeds. These he piles in front of the female, who works quickly, building and shaping the nest.

Soon the eggs are laid, each lavished with speckled designs that could easily pass for pointillist art. Triplets are the rule. When they hatch, the parents stand faithfully by, regardless of weather, to protect their brood from the hazards of the elements. Neither pelting rain nor hail nor burning sun has a chance to damage the young laughers.

Hatchlings do not resemble the grown-ups; no black head, no white tail, no dashing steel-gray wings, but instead a demure brown. This may be embarrassingly

un-gull-like, yet the parents are good providers and there is no reason to fuss about fashion. Even after the precocious laughing gull spreads its awkward wings and starts to fly, it can still count on upkeep from the folks; all of which leads the adolescent laughers into a relaxed and lazy life. Before long, however, the jig is up, and each laughers comes to full gull-hood, complete with black head, white tail, gray wings, and laugh.

Winter chases the laughers south, to the green and white waters of the tropics and sub-tropics. While the birds have been found as far south as Brazil and Chile, most prefer to live their lives on North America's Gulf and Atlantic coasts.

The laughers is sometimes called the black-headed gull, although taxonomists have named it *Larus atricilla*, meaning black-tailed gull. This describes not the adult but the young gull, whose plumage contrasts sharply with that of its elders.

In truth, the laughers remains one of the least confusing gulls. Its black head copyrights it, and the piping laughter identifies it instantly. When you have satisfied your urge to be—if only for a few exotic days—an itinerant beachcomber on the Outer Banks or the Florida Keys, then your wild and friendly feathered company will be the happy and carefree laughing gull. It is not bad company, at that!



A queen and approximately 1500 workers like this one were obtained from their original desert burrow and placed in the tunnel ant exhibit.



*An unusual museum display
helps visitors to*

Consider the Ant

By PEGGY PICKERING LARSON

Photographs by Wyatt Davis

"GO TO THE ANT . . . consider her ways, and be wise," directed King Solomon to his brethren. Today, more than 2000 years later, visitors to the Arizona-Sonora Desert Museum find themselves doing just that, as they consider the ways of one species of desert ant in a most unusual new exhibit.

A colony of *Novomessor cockerelli*, a large, long-legged, black desert species is being exhibited in the underground tunnel at this museum near Tucson, Arizona. *Nature Magazine* for June-July, 1958, briefly mentioned this ant exhibit in an article about the entire tunnel. The purpose of the tunnel itself is to present a cut-away view of animal and plant life as it exists under ground in the Sonoran desert. The ant exhibit, following this principle, consists of a condensed cross-section of an

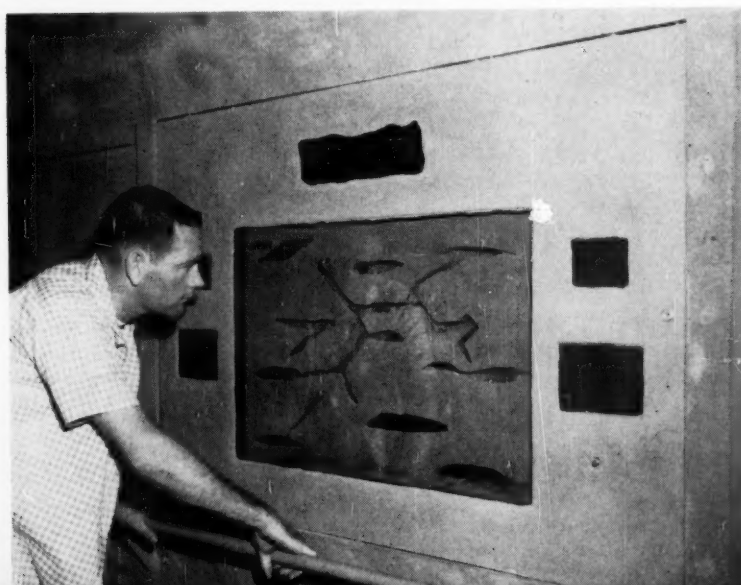
under-ground ant burrow. Here the queen, workers, larvae and pupae are all living a normal ant life, although finding themselves behind glass and under the interested scrutiny of museum visitors.

This unique ant home, placed within the tunnel wall, consists of a series of sand-lined rooms and connecting tunnels. The front of the display, behind a glass overlay, also is covered with sand, giving the illusion that a giant knife has sliced directly through a natural burrow in the desert, revealing the inhabitants living within their underground rooms. Soft light illuminates the ants in the burrow, and yet is dim enough to keep them content with their surroundings.

Ants within the display rest on the floors, walls and ceilings of certain chambers, some motionless, many cleaning themselves by using the strigils, or combs, on their front legs. Others of the colony busily go about the all-important business of caring for the queen, and the coming generations in the forms of eggs, larvae, and pupae.

The queen in this colony is most easily recognized by her enlarged thorax—the thoracic muscles having been highly developed to support

Soft light illuminates the ants living in the burrow within the tunnel wall. Visitors push small buttons at the sides of the exhibit to light pictures and text used to explain the display.



the wings that propelled her on her nuptial flight. Visitors see her within the burrow surrounded by workers who clean and feed her, and occasionally simply pick her up and move her from one place to another. Sometimes, as an ant prepares to pick up the queen, it goes through what appears to be, in human terms, an agitated "dance routine" before actually seizing her.

The eggs, produced only by the queen, are extremely small. Occasionally an observer sees a worker carrying about, or sitting motionless holding, a group of eggs, the total mass being only about two millimeters in diameter. The larvae, however, are quite obvious, being whitish, grubby-looking creatures with the anterior portion bent downwards; they resemble miniature albino candy canes. The larvae and pupae are stacked on the floors of certain chambers, although at times workers hold some of the young while hanging from the walls or ceilings. Workers bring bits and pieces of food into the burrow, and larvae are then placed on the food, where they feed themselves.

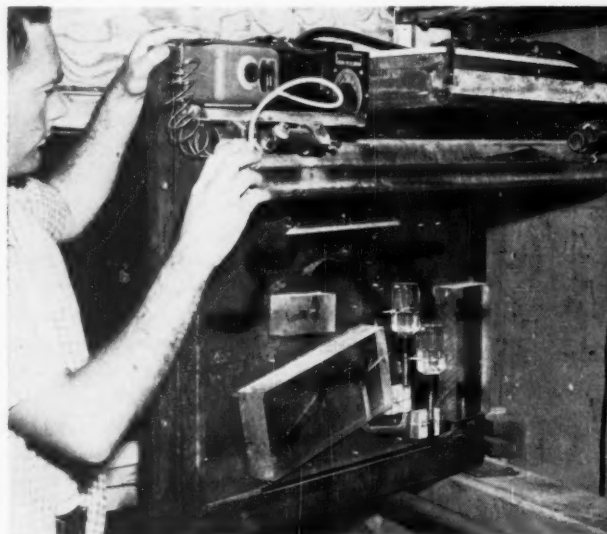
The young of this species do not spin cocoons about themselves, as do some ants, but go through a quiet, naked pupal stage. The various parts of the body, as the eyes and legs, are obvious at this time, but the pupae are not capable of eating or movement. In a few weeks the young adult emerges from this pupal stage.

The ants display definite ideas as to the proper uses for their many rooms, much as any self-respecting housewife. These choices on the part of the ants are largely prompted by the amount of heat and humidity present in each of the rooms. Within a natural burrow in the soil, the ants move their larvae and pupae from one portion of the nest to another, as the heat and humidity vary. These two factors are mechanically controlled in the exhibit, and so this colony rarely needs to transport the young from one section to another. Larvae and pupae are piled in a few of the chambers of the exhibit; the queen and her retinue are sometimes found with the young, and sometimes found in a separate chamber. Some rooms are used for refuse, and two contain only pieces of gravel piled neatly at their extreme ends. These piles of gravel mark two places where the ants

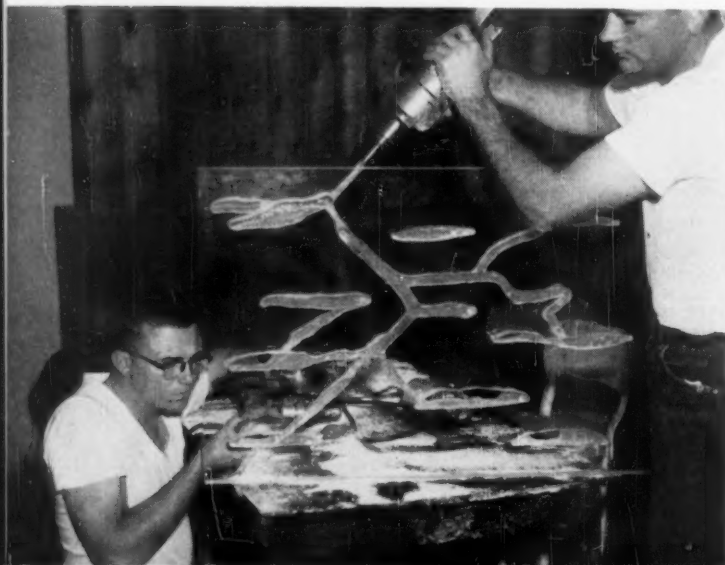
have actively complained about the construction of their home. At these points more light was entering the burrow than the ants cared to have. By moving gravel in front of the two areas, they effectively blocked out the illumination!

These ants are probably omnivorous. They do seem, however, to prefer meal worms and grasshoppers to any other type of food that has been offered to them in captivity.

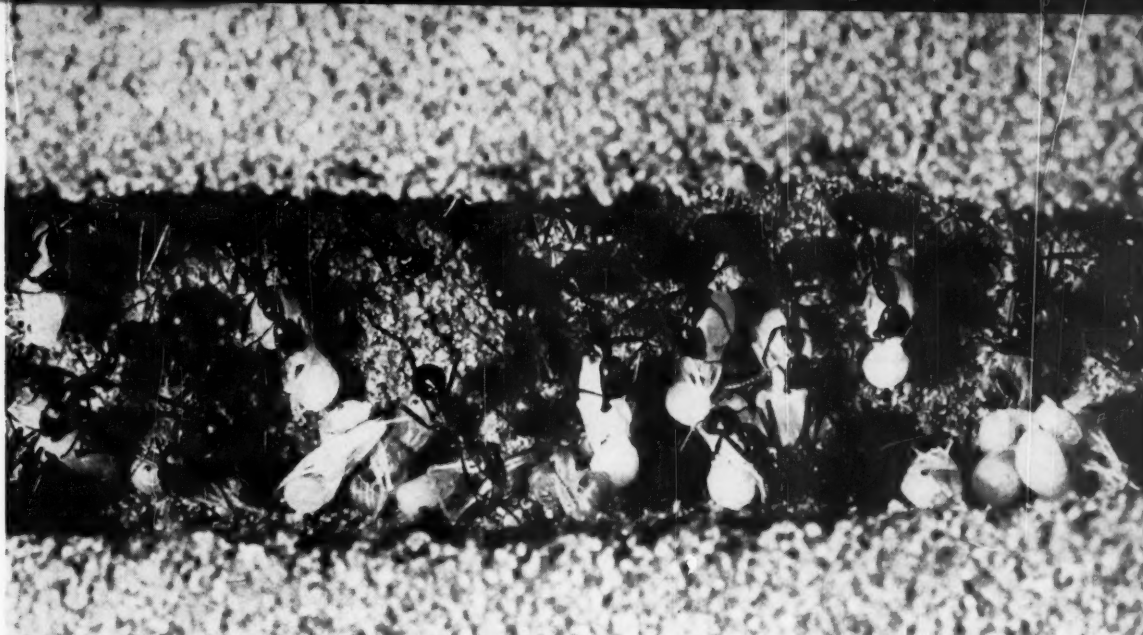
Obtaining this ant colony complete with queen—a necessary member if the colony is to endure beyond the lives of its present occupants—was a large-size undertaking. Power equipment gouged out a trench six feet deep adjacent to the original desert burrow of the colony. The soil remaining between the burrow and the trench was chipped away, and each ant, as it made its disgruntled appearance, was gently picked up and placed in a container. The two museum employees engaged in this activity were fortunate in obtaining the queen and also about 1500 members of her colony. They were not so fortunate, though, when these ants exercised their



The exhibit swings away from the wall, revealing (below) water reservoirs and blocks of plastic giving added depth to some chambers. At center, the heating unit; at upper left, the thermostat; and at upper right, a substitute out-of-doors with a sun lamp.



The burrow cross-section, illustrated at the left, was constructed of a solid piece of transparent plastic. Rooms and tunnels, patterned closely after the ants' original desert home, were drilled within the plastic sheet.



Within one of the rooms of the ant exhibit, workers clean, move about, and generally care for the pupae, which display eyes and legs but are as yet not capable of movement.

ancient prerogative of biting the hands that picked them up.

In the museum laboratory the colony was placed in a shallow, glass-topped box with many different small rooms. The ants also had access, by way of a plastic tube, to another box complete with sand, dirt, and sun lamp, this being their "out-of-doors." The many rooms in the box were kept in darkness, and various combinations of heat and humidity tried in each room to determine the best conditions for the ants.

As these experiments progressed, the condensed burrow cross-section for the tunnel was being created. Copied as closely as possible after the original cozy home of the ants, it was made out of a two-inch-thick piece of clear plastic, measuring thirty inches by twenty-four inches. Rooms and tunnels were drilled in the plastic with power tools. All of the surfaces of the exhibit were then coated with fine sand, glued on with plastic. Since light striking the edge of a piece of the plastic spreads evenly throughout the entire piece, this display is provided with a soft, even light.

The completed exhibit, as installed in the tunnel, swings away from the wall for servicing from the rear.

Attached to the back of the plastic sheet are numerous complex mechanisms. A box, heated by infrared and ultraviolet lights, provides a substitute out-of-doors for the ants, and here they are fed. Two water reservoirs, with tubes leading into the lower chambers, establish proper humidity. An infrared heat element, controlled by a thermostat, furnishes heat for the burrow; an input controller varies the amount of electricity reaching the heat element per unit of time for even heating.

Mervin W. Larson, curator of exhibits, was responsible for designing and building the novel exhibit. He was assisted by Robert Craig, also of the museum staff. Funds for the ant exhibit, as for the entire tunnel, were provided by the Charles Lathrop Pack Forestry Foundation.

After seeing the tunnel ant exhibit, many people are finding themselves with a new regard for these remarkable insects, and also with a little added insight into the ways of Nature. Although these are not harvester ants like those King Solomon was referring to, visitors consider and grow wiser when they see the remarkably intimate display of the ways of the ant at the Arizona-Sonora Desert Museum.



PASTORAL

*The shepherd lad, with kindly crook,
With leather pouch and horn,
Sets cheerly forth, afoot, at dawn
To greet the sylvan morn;
He leads his sheep to pastures green,
To wander where they will
While he herds
Flocks of violets
Upon a wooded hill.*

Elizabeth Pingree

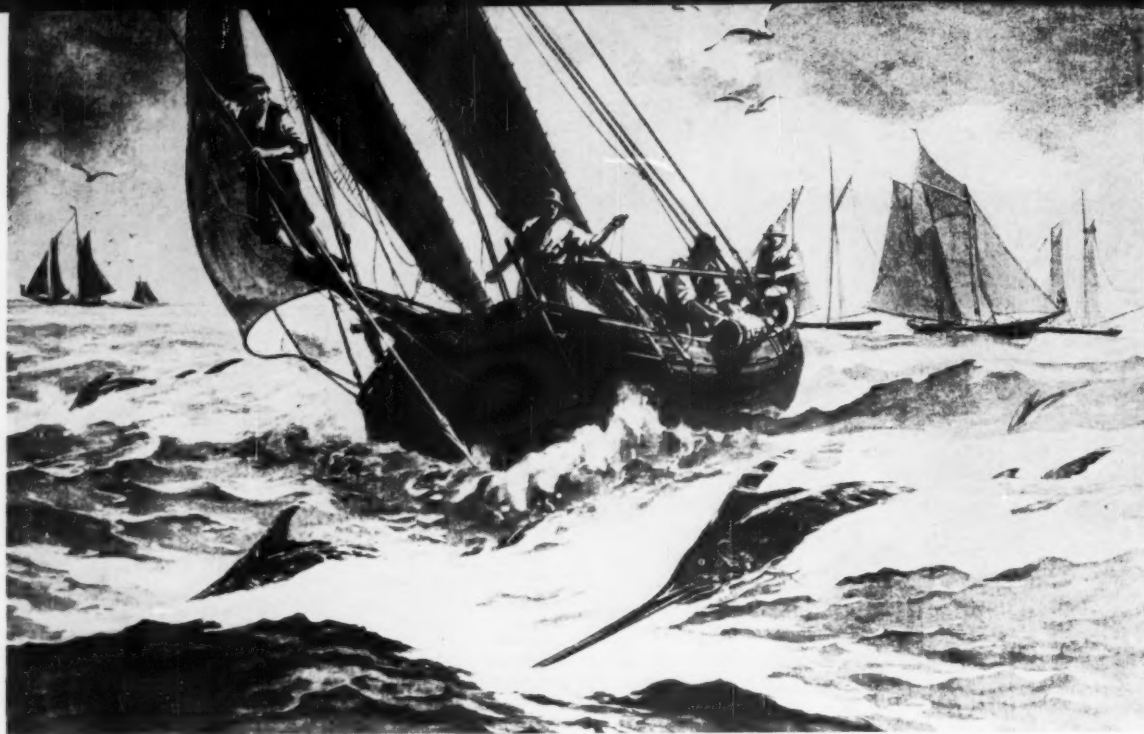


ILLUSTRATION BY M. J. BURNS

An artist's conception of a sword-fishing scene off Nantucket on the Massachusetts coast.

The Emperor Wears a Sword

"SWORDFISH to starboard!" shouts the lookout from aloft. The fishing vessel swiftly heads in the direction of a pointed fin on the surface of the flat sea off Martha's Vineyard near the Massachusetts coast.

"Fish dead ahead," cries the lookout, and the ship slowly approaches the fin. Another swordfish is soon on its way to market, and this scene is repeated many times during the summer months along the New England coast. The swordfish is one of the few creatures of the sea that is still pursued by New England harpooners.

The swordfish, *Xiphias gladius*, belonging to the family Xiphiidae, is a pelagic offshore fish found on both sides of the Atlantic. It occurs in the Western hemisphere from Cuba to Cape Breton Island, off Nova Scotia. During the summer months, swordfish are moderately abundant near Block Island and No Man's Island, off Martha's Vineyard. Broadbill swordfish also occur on the Pacific Coast from the Santa Barbara Islands to San Diego.

Plowing through schools of fish, flailing and maiming with quick slashes of its keen, elongated bill, the swordfish is a most formidable adversary, as well as one of the ancient inhabitants of our earth. According to fossil evidence, these fish date from the Cretaceous Period of world-history, some hundred and ten million years ago.

To the Dutch, the fish is known as *zwaard-fish*; it is

espada or *espardarte* to the Spanish; the Italians call it *pesce-spada*, and to the French the fish is the *épée de mer*. The swordfish was known to the ancient Greeks and Romans, too. Nineteen hundred years ago Pliny mentioned the swordfish in his *Naturalis Historia*, stating (according to Holland's translation), "The Sword-fish called in Greeke *Xipbias* that is to say in Latin *Gladius*, a sword, hath a beake or bill sharp pointed, wherewith he will drive through the sides and planks of a ship. . ."

Swordfish are sometimes confused with the marlins and sailfish, as all three groups possess pointed bills. The swordfish has a broader bill than the marlin or sailfish, and lacks their pelvic fins. In addition, scales are found only on young swordfish less than thirty inches long, while adult marlin and sailfish possess distinct scales.

The "sword" of the swordfish is legendary in the yarns of seafarers. It reaches a length of four feet, and is an elongation of the upper jaw. The sword is usually nearly black on its upper surface, and pale underneath. Actually, the sword is a modification that takes the place of teeth in the mature fish, for the mouth of the adult swordfish is devoid of teeth.

The earliest record of American swordfish dates back to the discovery of the New World. Among the artifacts that Christopher Columbus brought back from his voy-

age of discovery was a swordfish sword. This weapon, seized from an Indian his men had slain, was taken to northern Italy and placed in the Church of Siena, where Columbus received his schooling.

Probably the first written account of swordfish in American waters was the following passage, written by Josselyn and printed in 1674: "In the afternoon we saw a great fish called Vehuella or Swordfish, having a long, strong and sharp finn like a sword-blade on the top of his head, with which he pierced our Ship, and one of our Sailors dived and brought it aboard."

Swordfish reach a formidable size. According to Bigelow and Schroeder, the heaviest specimen definitely recorded from the Gulf of Maine was one caught during the summer of 1921 by Captain Irving King, and landed at the Boston Fish Pier. It weighed 915 pounds dressed, which would mean that its live weight would be some 1100 pounds. This specimen was not measured, but the sword was more than five feet long, indicating that the total length of the fish must have been about fifteen feet.

A swordfish taken in 1931, weighing 644 pounds dressed, was thirteen feet long from tail to the tip of

By

BERNARD L. GORDON

the sword. In 1932, a 925-pound swordfish was taken by commercial fishermen, and every year there are always a few swordfish of 500 pounds or more taken by harpooners. The world's record *Xiphias* taken by rod and reel is currently an 1182-pound giant, nearly fifteen feet long, taken May 7, 1953, off Iquique, Chile, by Lou Marron—a huge fish, indeed.

Commercial fishermen use a harpoon with a detachable end for capturing swordfish. When the fish is struck, the head of the harpoon usually remains stuck fast in the body of the fish and it is attached to a rope that has a keg, barrel, or buoy at the end. The rope and float are towed along by the fish, marking its whereabouts when it gives up the fight.

The swordfish is always harpooned from the end of the bow of the fishing vessel. It is next to im-

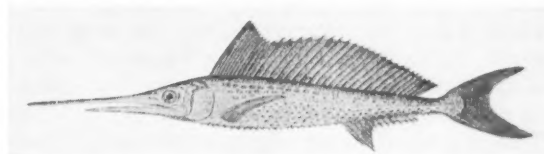
possible to approach this fish in a small boat. Boats engaged in swordfishing are fitted out with a rest, or pulpit, which consists of a narrow platform extending far enough out to enable the harpooner to get above the fish.

In foul weather, swordfish are not available. They come to the surface only during moderately smooth weather. With a lookout stationed at the masthead, the fishing vessel cruises the grounds seeking the tell-tale dorsal fins of the fish. A keen-eyed lookout may sometimes sight a dorsal fin at two or three miles with good visibility. When a fish has been sighted, the spotter sings out the location and the vessel quickly overtakes it. The approach must be made as quietly as possible.

Sometimes a harpooned fish will turn on its pursuers and pierce the bottom of the dory. Records show that one member of a swordfishing crew working under a Captain Ashby was severely wounded by a swordfish that thrust its bill through the oak floor of the boat on which the man was standing, penetrating about two inches of his naked heel. Many other such accidents have been recorded.

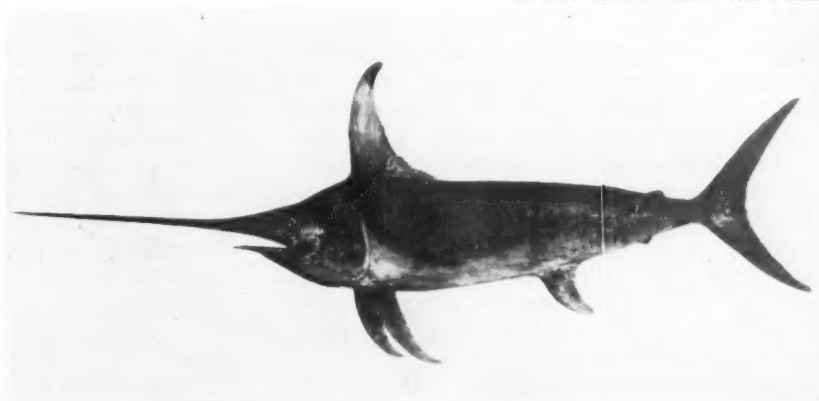
On August 7, 1887, the schooner *Volunteer*, out of Gloucester, Massachusetts, was off Block Island when it received a strong blow from a 300-pound swordfish that was swimming alongside. When the swordfish was harpooned and taken on board, it was found that the fish had lost its entire sword.

G. B. Goode, in his monograph published in 1884, gives many instances of swordfish piercing ships and boats. A remarkable incident he mentioned was this:



Conspicuous in the young swordfish but absent in the adult are the scales, as illustrated in the photograph above, from the *Histoire Naturelle de Poissons* of Cuvier and Valenciennes. Pictured below is an adult *Xiphias gladius*, the broadbill swordfish.

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Some of the "swords" in this collection, taken from fish that were caught in the vicinity of Block Island, show the results of rough usage by their owners.

"On the return of the whale-ship *Fortune* to Plymouth, Massachusetts, in 1827," said Goode, "the stump of a sword blade of this fish was noticed projecting like a cog outside, which on being traced, had driven through the copper sheathing, an inch board undersheathing, a three-inch plank of hardwood, the solid white-oak timber 12 inches thick, then through another two and a half inch hard-oak ceiling and lastly penetrated the head of an oil-cask, where it stuck, not a drop of the oil having escaped."

The following incident was reported in *Forest & Stream* for June 24, 1875: "On Wednesday of last week a Sword-fish attacked the fishing boat of Captain D. D. Thurlow while he was hauling mackerel-nets off Fire Island, thrust its sword clear through the bottom and stuck fast while the fishermen took several half hitches around its body and so secured it. It was afterward brought to the Fulton Market and found to weigh 390 pounds. Its sword measured three feet seven inches and its entire length was over eleven feet. The stuffed skin will adorn the Central Park Museum."

There is a saying among veteran swordfishermen that when you see a swordfish you may know that there are mackerel about. In the waters of the North Atlantic the swordfish feeds on mackerel, menhaden, bluefish, whiting, butterfish, squid and small sardine-like fishes. In feeding, the big fish rises beneath a school and strikes vigorously with its sword in all directions. After ram-paging through the school, the swordfish devours the victims of its carnage. Captain Benjamin Ashby says he saw a school of herring closely crowded together near the surface of the sea on George's Banks. A swordfish rose through the dense mass of fish and flailed the herring with such deadly effect that the captain was able to pick up a bushel of herring killed in this manner.

The exact mating grounds of the swordfish are still somewhat of a mystery. Myron Gordon, writing in 1935, said, "The American swordfish apparently swims the Atlantic Ocean, goes through the Straits of Gibraltar, meets its mates near Sicily and spawns."

Juvenile swordfish are quite common in the Mediter-

anean, being frequently captured in the mesh of seines and traps. Swordfish as small as one-half pound are sometimes found in the fish markets of southern Italy. The meat of the young swordfish is highly prized along the shores of the Mediterranean, and said to be perfectly white, compact and of delicate flavor. Young swordfish possess both teeth and scales, but these disappear in mature specimens.

The average size of the Atlantic swordfish is from 100 to 300 pounds. Occasionally very small ones are taken by fishermen. One weighing six pounds, seven ounces was taken by the schooner *Anna* on George's Bank on August 9, 1922, and another of seven pounds was taken by the *Courtney* on a long line on Brown's Bank in 1931. On August 15, 1951, the trawler *Winchester* on the southeast part of George's Bank, in 46 fathoms of water, hauled up a five and three-quarter pound swordfish—the smallest ever reported off the northeast Atlantic coast.

Swordfish serve as hosts for many parasitic passengers, both outside and inside. One particular species of suckerfish, *Remora brachyptera*, has a symbiotic affinity for swordfish, and attaches itself by means of its adhering disk to the swordfish's sides or gill covers. Sometimes several remoras may be found clinging to one fish. Internally, swordfish are afflicted with at least twelve known species of endoparasitic worms and six species of parasitic crustaceans. These irritating parasitic pests have been found in swordfish gills, esophagus, stomach, intestine, and muscle. Crustacean copepods, insect-like creatures, also parasitize swordfish both externally and internally. One copepod parasite has found a niche for itself in the cavity of the frontal bone of certain swordfish.

In 1956, 767,000 pounds of swordfish were landed by United States fishermen, and every year considerable quantities of frozen swordfish from Canada and Japan are imported into the United States, as our domestic fishermen are unable to meet the demand for the fish. Thick steaks, entirely free from small bones, are cut from the big fish. The meat is excellent when broiled or baked. Swordfish have a delicate flavor that is different from any other seafood, and swordfish liver oil has been found to be exceptionally high in Vitamin A and Vitamin D.

Fresh swordfish is usually available only during the months of June, July, August and September. Prices are highest in June and lowest in August, during the peak of abundance, but frozen swordfish may be obtained throughout the year.

Because not much is known about the growth, age or fluctuations in abundance of this creature, research on an international scale is now being organized to solve some of the mysteries of the much-sought swordfish. ♣ ♣ ♣



In this winter landscape, trunks and principal branches in the tree group at left are from selected roots, thinned out, to which cuttings from western tree lichen have been cemented for suggesting the lesser branches and terminal twigs. Blending of the two components was accomplished by giving both a common color and texture through sprayings and siftings. The weathered and twisted dead trunk at right is from shrubby cinquefoil. For the slender, brushy forms beyond the stream, filament-like blossoms from smoke bush were used. The water is glass and the snow is table salt.

The World in Miniature

In this diorama *Noah's Ark under Construction*, done for the Mariner's Museum at Norfolk, Virginia, the scale is only a sixteenth-inch. Variation of treatment and choice of siftings permit a degree of scale latitude while still using the same group of natural materials.

By JOHN L. HAWKINSON

Photographs by the Author





A snow scene, done for a photographic Christmas card, in which the large tree-top behind the cottage is of bare joe-pye-weed tips, bunched. The vertical foreground form, seen in part at left, is a spike of steeple-bush blossom. Low shrubs in gap are of clematis seed heads, the others from smoke bush. On ground and cottage roof, snow is table salt; on trees and shrubs it is an application of aerosol spray sold for decorating purposes.

IT WAS during a visit to Japan in 1920 that I had my first glimpse, at an art exhibition, of those skillfully contrived tray landscapes known as *bonseki* and *bonkei*. I was fascinated by them, and then and there determined that some day I would try to work out a "western" version of these works of art—one less circumscribed, perhaps, by rigid rules of traditional procedure and treatment.

It was not until seventeen years later that I was able to do something about this dream. An intermediate step had done much to prepare the groundwork. I had acquired a readily accessible tract of country land, some ninety-odd acres of woods, and a meadow with a brook. Spare-time forays into this property heightened an already keen interest in the out-of-doors.

Such continued delving led me inevitably to the intriguing fact that Nature abounds in repetition. The

largest forms, if not quite duplicated, at least are again and again closely approximated through a range of lesser scales that descend down into microscopic levels. Missing or differing color and texture make such similarities less obvious, yet the *forms* still are there where anyone may find them.

Reasoning from this premise, if desired color and texture elements somehow could be supplied, might not these ready-made small forms be adapted, rearranged and variously combined for purposes of representing the landscape in miniature?

The dioramas shown on these pages are some of the results of more than twenty years of trial-and-error in developing a basic technique, and yet I feel that I still have barely scratched the surface of the ultimate possibilities of the art.



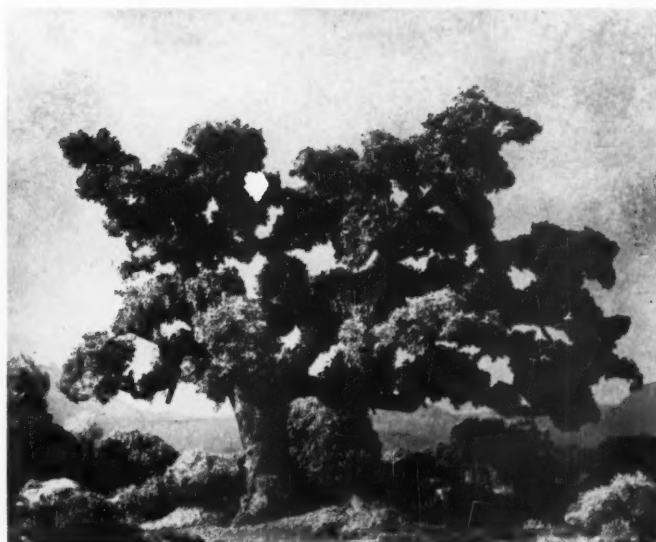
This diorama, from a sketch thought to have been of the Mark Twain birthplace in Hannibal, Missouri—later identified as *Huckleberry Finn's* house, next door—has foliage done with sprays and siftings over a clematis seed-head base, as was the "climbing rose" along the edge of the porch roof. Slender-trunked flowering tree is a bit of smoke bush blossom cemented to a piece of root. Spruce branches are small cuttings from an evergreen glued to a tapered trunk. Grass tufts are from cat-tail.

This glimpse of "swamp country" was put together for a camera study. Island at right, shaped from wallboard, was surfaced with real moss for a rough grass effect. Tree trunk and stump were root fragments, somewhat thinned, from shrubby cinquefoil. Streamers of moss were wool yarn, given texture by siftings after adhesive spray. For the foliage on the near-dead tree, and for scrubby growth edging the water, clematis seed heads were used for the basis of form, with various siftings applied. Window glass made the calm water. Sky and distant horizon, from a Kodachrome slide, were re-photographed on a single negative with the foreground elements.



Connecticut's historic "Charter Oak," blown down during a summer storm in 1856, was estimated to have been more than a thousand years old. Shown here, partly completed, is a miniature version done in 1939 as an experiment in tree portraiture. A popular engraving was used as a pattern in simulating the essential branch structure, which was contrived by combining carefully chosen parts from maple roots. Contours of the massive trunk were approximated by modeling in plastic wood.

This is the Charter Oak as it appears today in its diorama setting. Without altering the tree's distinguishing characteristics, a fuller, more vigorous foliage was given it to represent the tree at an earlier date, more as it might have appeared when the charter was concealed in its hollow trunk in 1687. Leaf masses here are made from seed heads of wild clematis, on which a sequence of pre-colored materials have been sifted after an adhesive spray.





Some twigs—usually the more complex, close-branching kinds—are adaptable for tree building. The sturdy form, (above, left) shown as found, came from a scrubby wild apple tree in a pasture. It can be much improved by thinning and rearranging. In photograph at upper right, four lower branches have been removed, along with one or two that formed the original top. The trunk has been shortened about two inches, and a kink filled in. Three of the eliminated branches have been reattached to give the whole a more pleasing outline. All loose bark has been scraped away for more secure bonding-on of foliage elements.

Leaving parts of the branch structure exposed, cuttings from prepared clematis (lower left) have been cemented in place to conceal too-heavy terminal tips. Here and there, as character notes, tips have been left uncovered to suggest dead or dying limbs and stubs. After transfer to its diorama setting, (below, right) surrounding forms help give the twelve-inch tree a look of stature and realism. In quarter-inch scale, it represents a real-life height of 48 feet.



Land of Fruit and Flower

By DOROTHY SHARP CARTER

Photographs by the Author

EARLY explorers of the area that is now the South American State of Paraguay likened the countryside to a Garden of Eden—and many modern visitors would quite agree that they were right. Even the name of this country is supposed to be derived from its abundance of certain trees and flowers.

Nearly sixty percent of Paraguay is covered by forest, and in the past few years forest products have accounted for some forty to fifty percent of this nation's exports, in spite of a lack of roads and other transportation facilities. It has been said that the medicinal trees and plants of Paraguay's flora are so numerous that, after Greek and Latin, *Guarani*,—the Indian tongue of Paraguay—has furnished more scientific names than any other language!

Presented here are some typical plants of Paraguay that lend color and value to town and country in this nation.



The papaya, or *mamon*, is a common plant in Paraguay, whose native species is highly resistant to disease. All organs of this plant contain a milky, bitter juice that is useful as a meat tenderizer. The pulp of the large fruits is said to be of value in the treatment of fevers.



The jasmine mango, *Plumiera rubra*, is a low, gnarled tree that would look at home in a Japanese painting. In the spring its rose-tinted, lily-like flowers make it a most striking tree.



The clusters of trumpet-shaped flowers of the yellow *lapacho* are so dense that they obscure the tree's branches, as shown at left. The *lapacho* is the national tree of Paraguay, and during the Paraguayan late winter—in August or September—camera fans first photograph the pink blossoms of *Tabebuia ipe*, and somewhat later the yellow varieties. A white-blossomed variety of *T. ipe* is found in the Paraguayan interior.

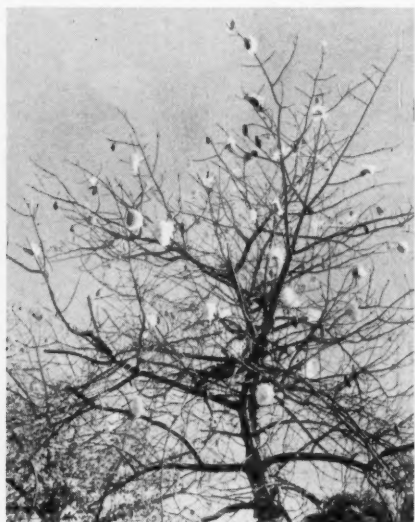
Among the trees of Paraguay that are both ornamental and useful is the orange, brought in by the Jesuits in the seventeenth century, and now common throughout the country. It flourishes with little or no attention, and millions of fruits are allowed to remain where they fall every year. Paraguay is the world's largest producer of petit-grain, an oil used in the manufacture of perfume and distilled from the leaves of the bitter orange, *Citrus aurantium*. Many of the streets of Asuncion, the nation's capital, are lined with orange trees, as shown in this picture.



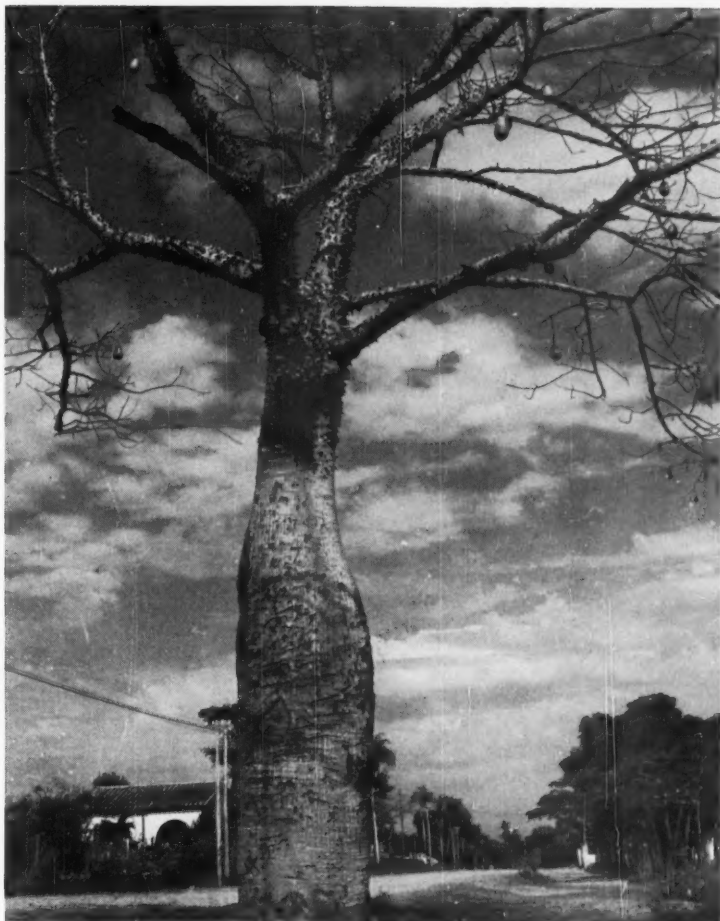
One of the flowering plants that lends a cheerful color to an otherwise chill and dreary Paraguayan winter is the unusual *margarito del campo*, the country daisy, which is known only in its cultivated form. It is a tall shrub, covered with white, yellow-centered daisy-like flowers, and was originally brought in from the Canary Islands.



After the flowers and leaves of the samuhu (shown at the right, below) disappear, the large fruits, filled with cottony fiber long and strong enough to be used for textile and filling purposes, are left on bare branches.



One of the country's more unusual trees is the native samuhu, or *palo borracho* (drunken stick), so named because of its deformed, inflated trunk. In February, the samuhu brings forth cream or rose-colored blossoms that remain for several months. The two native species, *Chorisia insignis* and *C. speciosa*, may reach a height of about 50 feet, with a trunk diameter of six feet.

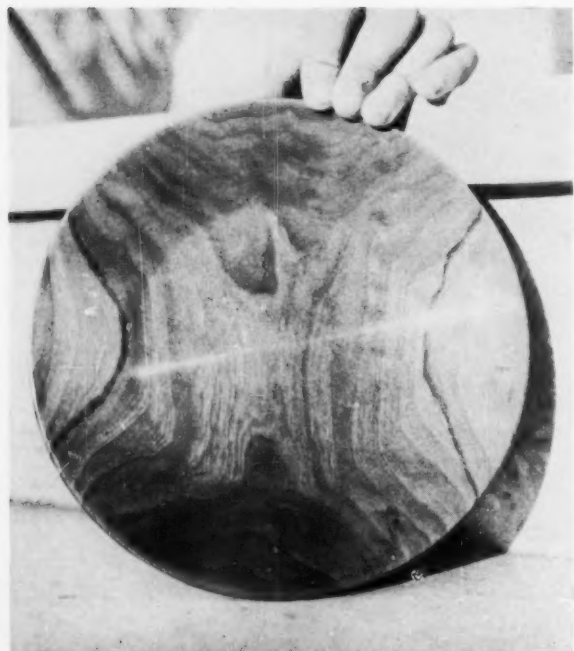




The Paraguayan coco palm, *Acrocomia totai*, grows densely in eastern Paraguay, but only on tilled land and never on virgin soil. It is said to "follow the plow." A palm fifteen to twenty-five feet high may produce each year from three to five bunches of fruit, each bunch weighing up to twenty-five pounds. Palm oil is obtained from the pulp of the fruit, coconut oil from the kernel, and fuel and chemicals from the outer husk and inner shell. The residue provides feed for cattle.



The chivato guazu or flamboyant tree, *Delonix regia*, blooms at the end of the year, during the height of the Paraguayan summer, with flaming orange-red flowers two to three inches long. The pods, shown above, are dark reddish-brown and often are up to two feet long.



A colony of Hutterites—a religious sect—in Paraguay uses some of the beautiful wood of the *lapacho* tree in the manufacture of salad sets, bowls and plates, which are sold in Asuncion. *Lapacho* wood takes a high finish, is extremely hard, and so heavy that it sinks in water. The woodworkers turn out 60 large bowls like the one at the left from one large tree, besides numerous smaller bowls and other articles.

Beyond Words

By CARL LANCASTER

Illustration by Marguerite Gruver

IT WAS one of those usual sunny Sundays in southern California. The grandeur of the surrounding rugged mountains beckoned. Li (short for Lieselotte), whose Swiss nativity gave her a love for the great outdoors, often joined me on trips into the highlands, or to the desert, where the sun's rays seemed more penetrating and the air was scented by sage and other wild growth. The wilder and more rugged the terrain, the more she seemed to love it.

It was early in the morning. My sedan, a reliable companion on many a mountain grade and secondary road, was at the curb. I checked over the contents of my knapsack for its simple equipment, plus pumpernickel sandwiches, an orange, apple, bananas and a package of dates. My hunting knife, most often handy for opening cans, cutting cheese or making kindling wood, was more of a display in its belt sheath. Tossing the loaded knapsack into the back seat, I headed for Foothill Boulevard to pick up Li. She was waiting with a smile and a couple of pomegranates to add to our colorful menu. We headed for Highway 66 and turned east toward San Bernardino and the foothills of the San Bernardino Mountains, where we would be welcomed by the natural beauties of a land above and beyond the cultivating hand of man.

The sun was high as the old sedan droned along the winding mountain road. The motor was heating a bit, but with an occasional friendly pat on the dashboard, we urged our tired steed onward, until we reached a point where a footpath, hewn out of the mountain face, led upward and outward on the sunny side of the canyon. Taking the knapsack, we hopped across a small creek and swung up along the mountain trail. The grade was steep at times, but we climbed steadily to reach a promontory that afforded a magnificent view up and down the gorge. The winding road, up which we had driven, seemed a narrow ribbon now. Solitude and primeval beauty were about us.

Soon we continued along the trail. There was a sharp bend immediately ahead. Blind curves always arouse my curiosity as to what might lie beyond. The bend curved around a steep overhang, and an odd noise broke the quiet. We stopped to listen intently. It seemed to be the sound of frantic struggle, as of some animal in the underbrush. Approaching cautiously, with Li close behind, I peered around the bend. The path widened. Scrub oak, grass, and sagebrush grew along the inner side of the trail. Then we found the source of the noise—a young fox, desperately trying to free itself from the



clutches of a steel-jawed trap, secured by a chain to an iron pipe that was driven into the dry ground.

We moved closer, and saw that the left foreleg was badly gnawed in the captive's effort to gain freedom at any cost. The white gleam of bone showed from beneath the mangled shreds of bloodied and soil-caked sinew. Li, behind me, apparently overcome by surprise and the simultaneous emotions of fright and compassion, started to be sick. Approaching within a few feet, I reached out, but the fox made no move, save for the short quick gasps of breathing. Li moaned and wept faintly. My hand was near the animal's mouth. It was not boldness or dare-deviltry that caused me to move close. Every move now was cautious and deliberate, accompanied by low undertones of voice. The fox slowly raised its head and looked at me. Something passed, then, between man and animal; a force stronger than fear and evil—an understanding beyond mere words! Whatever it was, it prompted me to pry open the powerful jaws of that torture instrument. This was accomplished with considerable effort and with due regard for the delicacy of the situation. A wedge-shaped stone, placed in one corner of the open trap, served to hold it open while I gingerly removed the captive's crushed fore-paw, which stuck to the steel. The fox made no sound, no attempt to bite, and did not struggle. He remained perfectly still, looking up at me. Completely freed, the fox made no move to get away, merely resting there on its haunches and belly, still gazing at me.

It was a beautiful animal, its pelt with a healthy sheen. He raised his lacerated paw now, pulled to his feet and hopped away a few steps. He turned his head to look back, then disappeared into the thicket.

Turning to the trap, I found there was another, also. One had already been sprung, and both were attached to the same iron pipe by a four-foot chain. With some effort, I wrested the pipe from the ground and hurled the whole assembly into the canyon, where it landed in the brush, far below.



Dead Land Comes to Life

By CLARA HUSSONG

Photographs by Lefebvre-Luebke

FIFTEEN minutes by automobile from the heart of the city of Green Bay, Wisconsin, there is a tract of land—some two hundred acres—that thirty years ago, when the city bought it, was soggy wasteland, a marsh "fit only for dumping refuse." Today, the area is the wintering ground for more than 4000 mallard, black, and other ducks, and hundreds of Canada geese. This scene of avian activity, at the northern edge of the city, is the Green Bay Wildlife Sanctuary.

There are, of course, a number of different ways in

connecting lagoons, and on the islands built from the surplus earth. Those that nest there through the summer, or to whom the Sanctuary has been "home" for some time, come up on shore readily when visitors scatter corn for them. Corn is on sale on the grounds at five cents a bag, and the profit from this venture almost covers the cost of feeding the ducks and geese. Incidentally, ornithologists have found that this is the most northerly wintering area for Canada geese in the State.

Winters are cold in Wisconsin, and even the nearby

bay waters become frozen over for miles out into the lake. The part of the lagoon nearest the observation building is kept open by means of propellers powered by an electric motor, and by the swimming activities of the birds. In long spells of way-below-zero weather, park employees go to the assistance of the birds by chopping away at encroaching ice, in order to keep the open area large enough.

It is in winter particularly that Green Bay people like to come to the Sanctuary, and to bring their guests to see the birds. They like to watch the thousands of ducks come swarming up on shore for their share of the corn, and to photograph the green heads glinting in the sun. The Canada geese, strutting about on the nearest island, their special domain—or coming in for a landing on the lagoon—are "shot," but only by photographers.

Nearly 175,000 visitors come to see the birds each year. Among them are school classes and Scout troops that come with their teachers or leaders. In cold weather, visitors use the glassed-in observation platform from which to view the birds.

In spring and summer, three-quarters of the Sanctuary's 200 acres is closed to the public. This is to allow the mallards, blacks, wood ducks, pintails, blue-winged

teals, Canada geese and other birds to build their nests and raise their young in peace and privacy. When spring comes, some of the wintering birds leave for other breeding grounds, but each year hundreds of ducks and dozens of geese are hatched and raised here.

Other birds that breed in the "exclusive subdivision" are pied-billed grebes, green herons, common gallinules, and such other marsh dwellers as the long-billed and short-billed marsh wrens, and red-winged blackbirds.



Nearly 175,000 people come to see the birds at the Green Bay Wildlife Sanctuary every year. During cold weather, they may watch from a glassed-in viewing platform that overlooks the open pool.

which such sanctuaries may be established. Land suitable for refuge purposes "as is" may be appropriated, or a wildlife habitat may be restored to as near its natural condition as possible. In some cases barren and uninteresting "waste land" may be converted into an area inviting to native wildlife. The Green Bay Sanctuary was developed through a combination of these approaches. Through most of the year the ducks and geese spend their time on the three miles of man-made

Superintendent Marshall Simonds, a key figure in the evolution of the Sanctuary from wasteland, feeds corn to Canada geese on one of the lagoon islands of the area.



A small deer herd lives in the fenced-in section of the Sanctuary, and during the winter is provided with open sheds and feed. Among the most popular photographic subjects of the area are the fawns that are born each spring.



The area is not all marsh and lagoon. There are grass patches where killdeer, meadowlarks and bobolinks nest; shrubby stretches that are the home of yellow warblers, yellowthroats, song sparrows and alder flycatchers; and stands of evergreens and deciduous trees where all sorts of birds, from red-eyed vireos to scarlet tanagers, find nesting sites.

From a public highway that edges a wooded section of the Sanctuary, bird students can hear the quavering, spiral song of the veery during spring and summer evenings. The pumping of the bittern, and the clattering call of the Virginia rail are other bird sounds they listen for. Even such little known native sparrows as Henslow's and LeConte's have been observed within the Sanctuary.

One fall a snowy egret stayed around the marshy edges of the lagoons for several months. This, local birders believe, was the farthest north that this "black-stockinged, yellow-slippered" egret has been reported.

In spring and fall this is a natural resting spot for migratory birds. Although the bay shore is only a block or two away, it is becoming increasingly crowded with homes as the city and its suburbs stretch out.

Water and shore birds that during migration have stopped off at the Sanctuary include blue and snow geese, such ducks as the shoveller, lesser scaup, and bufflehead; black-crowned night heron, sora, Wilson's snipe (now called "common" snipe), dunlin—a flock of these "red-backed sandpipers" was seen in a rain pool in the landscaped "park" part of the Sanctuary—and both the greater and lesser yellowlegs.

Whistling swans by the thousands use the bay waters each spring and fall as a resting and feeding spot in their journey to and from their arctic nesting grounds. Sick or injured birds that are found are often picked up and brought to the Sanctuary to be treated and cared for. From four to ten swans may be found convalescing here, winter or summer.

Even the landscaped entrance section of the grounds, with its picnic facilities, is attractive to birds. All the planting was done with the needs of birds—cover and food—in mind. Here, in spring, when trees and bushes burst forth in flower, bird students may find dozens of warblers, including the Cape May, orange-crowned, Blackburnian, parula and magnolia species. Green Bay Bird Club members never fail to tour the Sanctuary grounds each year on their annual May Day counts, and are always rewarded with "wanted" species.

Near the caretaker's quarters is a deer pen in which a small herd of deer lives the year around. Fawns are born here in spring, and all through the year it is one of the Sanctuary's most popular spots for tourists to visit.

The man who turned the marshy wasteland into a wildlife haven is Marshall Simonds, now retired park superintendent. Twenty years ago he drew up the blueprints for the refuge, and in the following years superintended the digging of the lagoons, the landscaping, and the other work of transforming the area.

Superintendent Simonds knew that he would be most successful with his project if he collaborated with Nature. Much of the area was left in its natural state; the marshes, the alder and willow swamp, the patches of aspen, ash and other trees. In assisting Nature, the superintendent worked tactfully, by introducing trees and shrubs that were native to the habitats he was re-



A mother mallard duck brings her brood out to show off to the public. In spring and summer, three-quarters of the Sanctuary's acreage is closed to the public to allow the ducks, geese and other birds to build their nests and hatch their young in privacy.

creating. Arbor vitae, tamarack, swamp maple, hawthorns, junberry, dogwood, high-bush cranberry, and wild plum were some of the species planted in their proper situations.

In his zeal to simulate Nature, Mr. Simonds even "transplanted" fallen logs and old stumps from nearby woodlands. These soon blended with their surroundings, and their little "hangers-on"—ferns, mosses, and tiny wildflowers—spread out to cover the ground. Water lilies were planted in some of the lagoons, and wild iris and other water-loving plants along the edges. In fall, "asters by the brookside, make asters in the brook." Superintendent Simonds says that the greatest compliment he can receive is to have people believe "it was always like this," and that all he had to do was to supervise a natural beauty spot.

During a short period when Mr. Simonds was away from Green Bay, the city nearly lost what is now one of its greatest tourist attractions. This was between 1935 and 1937—depression years—when many citizens grumbled over the "useless" tract of land at the north end of the city, and suggested as to "what to do with it." The suggestions ran all the way from filling it in and selling it for home or industrial sites, or building a public golf course on part of it, to "giving it back to the Indians."

It was rescued from some such fate by a group of outdoor-minded people who had other ideas. The group wanted to turn it into a wildlife

sanctuary. On December 7, 1935, a public meeting was called to discuss the idea. Only about fifty persons attended the meeting, which was presided over by Chester Cole, a local high school teacher.

Mr. Cole and other wildlife enthusiasts outlined plans, and painted pictures of what a city-owned sanctuary might be—a place for ducks and geese to nest, waterfowl and shore birds stopping at the lagoons in migration, and song birds finding homes here, or using it as a stopping place in their spring and fall flights.

Some of the speakers had visited Jack Miner's Bird Sanctuary in Kingsville, Ontario, and they could see no reason why "we can't have something just as good." The audience smiled politely, but skeptically.

Nevertheless, the Green Bay Wildlife Sanctuary Club was formed, with Mr. Cole as its first president. It was incorporated April 23, 1936. The first job of the club was to get Green Bay people interested in a wildlife sanctuary, and to whip up moral and financial backing from individuals, clubs and business and professional firms.

It was not easy, as anyone who has ever worked on a civic project knows. Publicity, benefits, and donations to the "Wildlife Fund" followed, however, and before another year had passed the "city fathers" turned over 40 acres of land to the Wildlife Sanctuary Club, "to

As many as 500 Canada geese may winter at the Green Bay Wildlife Sanctuary each year, and open water is maintained for them and for the 4000 mallards and black ducks that stay. During long spells of below-zero weather, park employees must chop away encroaching ice to keep the open area large enough.



Several whistling swans, shown in the picture at right, are always present at the Green Bay Wildlife Sanctuary. These are birds that have been picked up on the nearby Green Bay shore, where they were found ill or wounded.

see what they could do with it." They began digging, literally—and by hand. The few ponds that were dug were meant to prove, and did prove, that waterfowl would come in from the bay and make use of the area. Further help came in the form of NYA appropriations, loans of machinery, and man-power. The first lagoons were started.

Marshall Simonds returned as park superintendent in 1938, and the city council voted to turn the entire 200-acre area into a sanctuary. From 1938 to 1941, it was a WPA project, with the consequence that it cost the city only a small fraction of the actual outlay of money needed to accomplish the job. By 1941, the Wildlife Sanctuary Club disbanded, its purpose in serving as a "spark plug" for the project being finished.

Mr. Simonds retired from his post as park superintendent in Green Bay on July 1, 1958. With his wife, Marion, he moved to their cottage on the shores of Lake Michigan, near Holland, Michigan.

Green Bay people miss his former frequent presence at the Sanctuary, and his enthusiastic accounts of what is going on there. He was the birds' reporter at the refuge, and through the local newspaper he informed the public of such doings as a mother mallard coming out of hiding

from the south end of the Sanctuary with her brood of ducklings; or that a flock of common or "American" egrets was spending the late summer there, after their post-nuptial flight from the southern breeding grounds.

Even the minor works of Nature interest him and prompt him to make a report. In the May 15, 1958, issue of the *Green Bay Press Gazette* appeared a small item in which Simonds invited local people to "come and see the hill of violets, which are now in full bloom."

Many people have already forgotten that the Green Bay Wildlife Sanctuary was once a marshy "dump," transformed into a wildlife haven by enthusiasm, wise planning, and dedicated work!



A Desert Colony

By CHARLES H. WALSH

Photograph by the Author

DURING THE better part of four decades of life on the Nevada desert, I have seen many odd and unusual things in Nature; but to me one of the strangest of all was an open-air colony of wild honey bees, found last spring while I was rock hunting in the Arrow Canyon Mountains.

Instead of setting up housekeeping in a cave or deep crevice, as wild bees in this area usually do, they chose the bare underside of a conglomerate ledge on which to build their home. They were protected from the hot desert sun and from rain, but were exposed to the withering blasts of summer sand storms and to the chill of winter winds.

Rugged and persistent these little creatures must be, to have survived in such an unfriendly environment.



A colony of bees had set up housekeeping in the Nevada desert under the overhang of a ledge of conglomerate, and they were filled with honey made from cactuses and other desert flowers.

They must have found it difficult indeed, during their first season, when they were "starting from scratch."

Now they are a strong and industrious colony with a mansion of beautiful pendulous combs heavy with brood, and with honey made from the fragrant blooms of cactuses and other desert flowers.





The invention of the electron microscope opened up new fields for the investigators of small particles like dust. Illustrated in this photograph are particles of carbon black, magnified 450,000 times by the electron microscope.

EVERY diligent housekeeper knows that dust is nothing but a nuisance—something to be eradicated with the least possible delay. Dust is something that has a great affinity for little boys, too. I recall the day when, as a youngster, I walked into my grandmother's home after a particularly spirited game of tag, and how that lady surveyed me from head to foot. "Little boys are walking dust storms!" said grandmother. That deep, velvety, warm dust of July was good to stroll through, and walking in the dust of the ball field was one of the well-remembered joys of boyhood.

Perhaps we are all so familiar with dust that we fail to appreciate its significance in the grand scheme of Nature. Dust, in its many forms, is everywhere. It is persistent, and it may even be deadly. Essentially, it consists of fine particles of matter, each too small to be seen by the unaided eye, and may properly include finely divided substances like smoke, smog, and the aerosols. The large amount of research that has been bestowed on dust during recent years has lifted it out of the category of "just plain nuisance" and has elevated it to the status of news—important news.

The advent of the electron microscope, in conjunction with the present vastly increased interest in the science of astrophysics, has pointed up the importance of dust. Says Dr. Clyde Orr, of the Georgia Institute of Tech-

nology, "The real mystery is why it has taken man so long to get around to investigating basic facts of the phenomenon." Of course, one of the primary purposes of the artificial satellites is to increase our knowledge of the dust that is known to exist in stupendous amounts in a space that long was believed to be only a void.

Aside from natural dust, there is a large and prolific family of fine particles that the human race could well

Our Dusty World

do without. These are the particles produced by our industrial civilization and our mechanized conveniences like automobiles, trains, airplanes and ships. Since the time of the atomic bomb, we have had the additional dust particles caused by the explosions of atomic and thermonuclear devices, and the story of man's more recent fine particles is not yet finished.

Some scientists say that, to understand the dust he takes for granted, man will need to stretch his imagination as well as to inform himself better, and even now

there are many "white glove" study operations under way at laboratories representing many different fields of science.

The basic tools of dust research include special filters, radio telescopes, electron microscopes and jet aircraft. At present, there is great emphasis on the proper design of space vehicles, and in order to get basic data useful for this purpose, among others, the Astrophysical Observatory of the Smithsonian Institution of Washington, D. C., is taking a census of dust particles found at heights of more than 50,000 feet above the earth's surface. Jet

A chemical engineer at Armour Research Foundation of Illinois Institute of Technology in Chicago collects settled dust samples atop the Foundation's Industrial Chemistry Building. The jar-like device is a standard gage such as is used by the city to collect its monthly dust samples. Jet

PHOTOGRAPH BY ILLINOIS INSTITUTE OF TECHNOLOGY



By JESSE C. BURT

planes from the famous Edwards Air Force Base in California, home of experimental aircraft, are being used in this research.

Equipped with special filters, the jets used in the dust project bring back samples of the fine particles found at high altitudes. The particles then are studied under high-powered microscopes. Eight percent of the dust collected so far is believed by the Observatory to be "extraterrestrial in origin;" that is, dust that did not originate on this planet, but which came from space.

for February, 1959

Incidentally, this program is overcoming a basic problem that long has beset scientists in their efforts to estimate how much space-dust is falling on the earth every day. Simply stated, the atmosphere immediately above the earth—the troposphere—is clogged with our planet's own dust, thus imposing on the researcher the time-consuming and complicated task of sorting out particles that the naked eye cannot see.

It is true that the artificial satellites transmit various kinds of dust information back to earth, but they still lack the important ability, as yet, to bring back any

Ninety-six ultra-sensitive radar antennas are perched on high poles in two rows on a Stanford University hill-top, picking out tiny meteors that are weighed in billionths of an ounce—a hundred times smaller than anything previously detected by radar equipment. These qualify as dust.

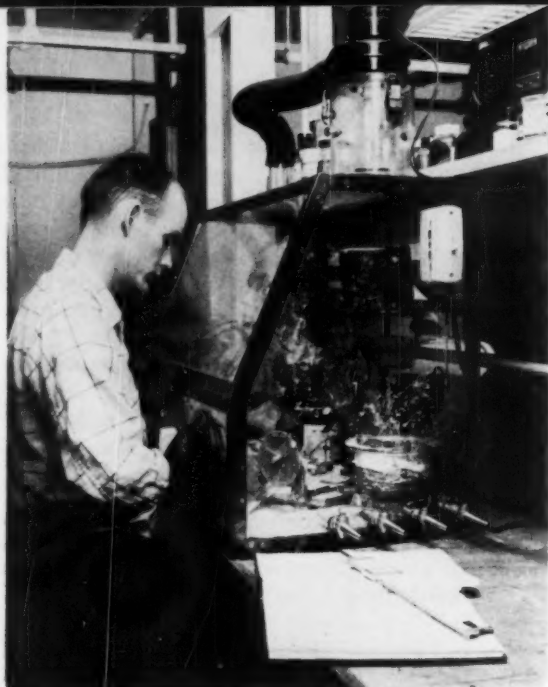
PHOTOGRAPH COURTESY OF STANFORD UNIVERSITY



dust. The Smithsonian Astrophysical Observatory program, which went into operation six months before the first artificial satellite "beeped" around the world, is filling the researchers' bins with dust.

It is a proved fact that there is a large amount of "star dust" that falls on the land and sea areas of our planet, although the mere existence of this sort of dust was not accepted until relatively recently. For instance, Thomas Jefferson, an able thinker and keen observer, scoffed at such reports, which were attributed to certain Yale professors. Jefferson said drily that he "supposed Yankee professors would lie as soon as they would tell the truth."

To be sure, the Virginian had had his political difficulties in New England, a fact that probably jaundiced his attitude. Today, nearly all scientists accept an estimate of 10,000 tons of space dust as being conservative in denoting the daily fall on the earth's surface. Astronomers at a meeting in Moscow in August, 1958, heard an estimate of 30,000 tons daily for space-dust fall on the earth.

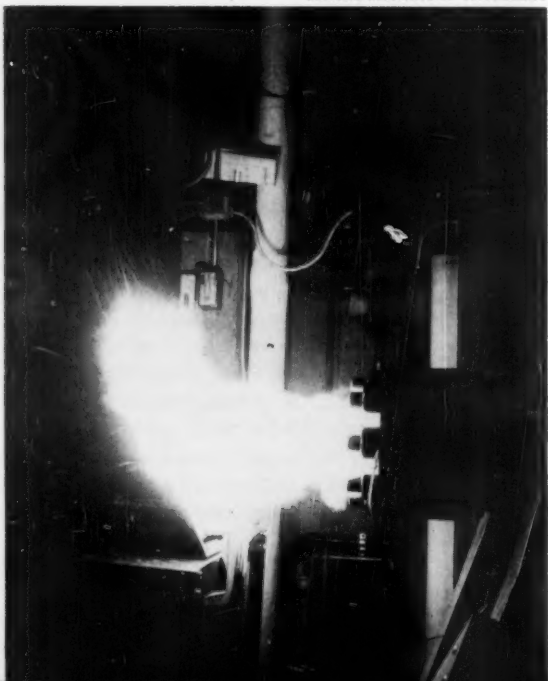


GEORGIA INSTITUTE OF TECHNOLOGY

Research assistant W. J. Corbett of the Georgia Institute of Technology works with a controlled atmosphere chamber to try to establish what it is that holds bits of matter together. Such bits of matter are known as dust, fine particles, or particulates.

High-speed dust splashes from a shock tube at 4000 feet per second and strikes against a copper plate at the Armour Research Foundation of Illinois Institute of Technology in Chicago. The experiment simulates conditions that may be encountered in space by guided missiles and space satellites. Dust moving at this speed was able to penetrate the inch-thick copper plate.

ILLINOIS INSTITUTE OF TECHNOLOGY



The long range implications of this fact are interesting to speculate about, if but briefly. For instance, one of the pioneers in space-dust research, Dr. H. H. Nininger, the director of the American Meteorite Museum, points out that the accumulation of cosmic dust is the only way in which the earth is growing at the present time. Immanuel Velikovsky, in his controversial *Worlds in Collision*, argued that thick clouds of space dust might in time encounter our planet in its orbit, and might slow the earth's rotation, or possibly stop rotation altogether.

Most of us enjoy a little speculation, but now that we know that there is a lot of dust in space, and that a knowledge of it will help designers of space vehicles, let us examine the implications of dust as they affect the common earth-bound mortal.

The origins of dust on earth are as various as is the composition of the dust. Major sources include blowing soil, ocean spray, shore erosion, volcanic activity, brush and forest fires, spores and pollen. Dust plays a significant role in the taste of foods and beverages, the fertility of the soil, in the colors that lend variety to our lives, and in rainfall. It has certain sociological and psychological implications, and has played its part in man's history. Some texts cite dust problems in the western "dust bowl" States as one of the causes of the last great depression, and it has been said that Napoleon, at Austerlitz, took care to have his people chew straw and expectorate as they marched, thus holding down the dust and gaining the element of surprise!

Dust may be a friend as well as an enemy to man's endeavors. Recently a miner friend took me through a Kentucky coal mine on my first mine tour. We went down a stairway straight into the earth for perhaps three hundred feet. I did quite well until the inevitable pause at the bottom of the steps. Then I saw the dazzling blue sky framed by the far-distant mine opening, and suddenly I longed to be back where I could see that sky. But before I could see the sky again and understand its loveliness, I first had to survive a noisy train ride through a narrow tunnel that was curiously white.

I had imagined that a coal mine would be black, not realizing that gray-white rock dust would be everywhere. It had been deliberately sprayed in the mine, except where the tunnel ended at the glittering black seam, as a safety measure against fires and explosions resulting from the coal dust! The return climb up the stairs permitted me the joy of seeing blue sky again.

According to Lord Rayleigh, distinguished British physicist, dust scatters sunlight and gives the blue tint to the sky. If the atmosphere were abruptly cleansed of its dust, our blue sky would not only disappear, but the human race also would be robbed of the glories of sunrise and sunset!

Dust is a major safety factor in the everyday life of the home, too. Although the energetic homemaker constantly wars against dust in all its forms, she has reason to appreciate its presence in her sparkling, modern kitchen. Without dust, steam would have no warning vapor, and thus would be most difficult to avoid. Steam

Investigators who must establish the nature of conditions in outer space, including its dust content, work with instruments like these in the Radio Propagation Laboratory of Stanford University, at Stanford, California.



STANFORD UNIVERSITY PHOTOGRAPH

burns would be even more common than they are now!

Although dust gives the sky its colors, insulates man, and provides him with warnings, there are times when it is not a benign influence. The peculiar horror of the dust storm, with its menace of suffocation, is one good example. There still are large areas in the United States where dust storms are a hazard. In 1954, for instance, the blowing area in which dust storms were observed was the equivalent of the "dust bowl" areas in the nineteen-thirties. In 1954, one dust storm strangled 1150 ducks and geese in southeastern Colorado.

An airplane pilot once told me of watching a dust storm begin while he was flying over the Texas "pan-handle." "You could see the dust raised by the wind," he said. "I had to bug out of there, throw the coal on, but I saw enough to give me quite a memory."

There is a wind storm in Asia Minor that bears the rather ominous-sounding name of "simoon." This is an eye-witness account of one of these storms:

"With the hot breath of the simoon, nature suddenly seems to be on fire; the sky is covered with an immense copper-tinted veil of dust. Suddenly a storm begins and drowns the scene in thicker and thicker dust. A fine dust penetrates the tiniest crevices, mixes with food and drink, and gets in the eyes, nose, and parched throat of the unfortunate traveler, whose face starts bleeding as it is struck by dozens of small, sharp pebbles thrown up by the wind."

The key to the behavior of dust, whether in storms or in calm weather, is the wind, called "the great natural scavenger of the atmosphere" by Sir Napier Shaw, authority on the smoke and smog problem. Rain does not "clear the atmosphere" of its dust load; the wind distributes dust so that it may eventually settle without harm to man. If the settling took place all at once,

calamity would result because dust, natural and man-caused, actually is heavy.

The distribution of dust is subject to change, as was painfully shown by the "death smog" at Donora, Pennsylvania, a few years ago, and as the smogs of Los Angeles and other cities show from time to time. The radioactive fallout of fine particles also has been added to our pollution problem, and, as former president Harry S. Truman has said, "The contamination of the atmosphere and its potential adverse effects on health, industry, agriculture, and natural resources are causing wide concern."

Man is in dire need of knowledge about his environment, and dust is one of the intriguing keys to that end. In most of Nature's grand dramas, like sunrise and sunset, and in rainfall, dust plays a major part. E. L. Grant Wilson, an English science writer, said, in explaining how dust particles are nuclei for each raindrop: "The presence of fine particles in the upper atmosphere not only gives us our clouds, our weather, and our sunset effects, but also makes habitable our world." Perhaps this is an adequate summary of the case for a thorough study of dust. There is one thing more about dust that is worth mentioning. Even our modern youngsters, with their space toys and helmets, like to play in it when they get a chance!



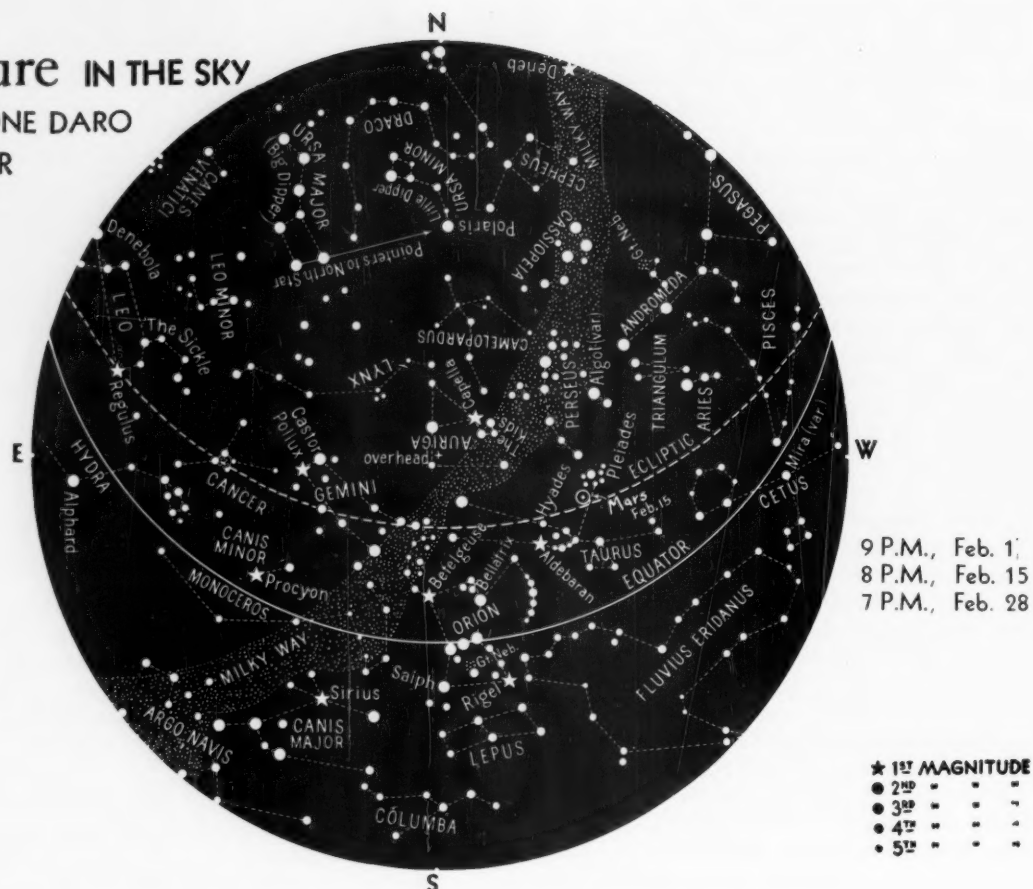
WALK AFTER A NIGHT RAIN

*The guest-book of the morning shows
Me late, who thought to be so early:
The signature of turtle flows
Here boldly, written with stub; the curly
Spencerian of a dainty bird
Come hours ago is extra fine;
While garter snake has registered
Beneath it with his curving line —
And happily, as chipmunks do,
A pair signed in italics! After
Their names in loveliness and laughter,
How drab for me to write in SHOE.*

Elaine V. Emans

Nature IN THE SKY

By SIMONE DARO
GOSSNER



To use this map hold it before you in a vertical position and turn it until the direction of the compass that you wish to face is at the bottom. Then, below the center of the map, which is the point overhead, will be seen the constellations visible in that part of the heavens. Times given are for Local Standard Time.

Early Days at the Cape

THE Cape settlement, which eventually became the province of the Cape of Good Hope or the Union of South Africa, was originally established in 1652 by the Dutch India Company. Located at the southern tip of Africa, it was a stopover point for the ships that traveled between western Europe and the East Indies. Navigation in that vicinity was always hazardous because the waters were rough, and the southern heavens poorly known. While the northern hemisphere had had astronomical observatories of a sort for as long as history has been recorded, civilization had barely begun to reach the bodies of land south of the equator. Yet the only means of determining accurately the geographic position of a site is by the observation of celestial objects. Until this was done for the Cape, mariners caught in bad

weather could find the harbor only with great difficulty, and there were many instances where they missed it altogether.

It was not until the middle of the eighteenth century that astronomy came to the Cape. The French Abbé de Lacaille came to Cape Town in 1751 and stayed for two years, pioneering in astronomical and geodetic observations. Writing for *Science*, D. S. Evans, of the staff of the Royal Observatory at Cape Town, describes the abbé as a "one-man research institute." This is no exaggeration. Working without assistance, Lacaille set out to assign boundaries and names to southern constellations. With the help of a small transit instrument, he cataloged no less than 10,000 stars, and proceeded to determine the geographic position of Cape Town. Having

thus taken care of the immediate needs of navigation, he turned to problems of astronomy and geodesy that were then of current scientific interest.

The shape of the northern hemisphere already had been determined with sufficient accuracy to indicate that it is a section of a flattened spheroid. Nothing was known, however, of the southern hemisphere. In view of this, Lacaille performed the precise triangulation of an arc of meridian. His observations led him to conclude that the shape of the earth south of the equator is that of an elongated spheroid. This conclusion, had it been true, would have made the whole earth egg-shaped. After years of trying vainly to account for such an unexpected result, geodesists eventually cleared the mystery by showing that the attraction of Table Mountain, near the southern end of Lacaille's base line, had caused a deviation of the vertical that had introduced systematic errors in the measurements the scientist had made—which was understandable.

After Lacaille's departure, astronomy lay dormant at the Cape for nearly seventy years. The province had fallen into British hands in the course of the Napoleonic Wars. Astronomical data for navigation was still lacking the necessary precision. Conscious of this problem, the British Government decided, in 1820, on the establishment of a Royal Observatory at the Cape of Good Hope. Six days later, on October 26, 1820, the Rev. Fearon Fallows, a Fellow of St. John's College, Cambridge, was appointed the first director of the newly created observatory.

Fallows, who had been trained mostly in mathematics, had little or no experience in practical astronomy. In order to prepare himself for his new post, he went on a tour of English observatories, paying much attention to the design and construction of astronomical instruments.

Having received from the Admiralty a set of detailed instructions in which his mission was outlined, Fallows sailed on May 4, 1821, with his bride of four months, the assistant astronomer, and his sister. The party arrived at Cape Town on August 21.

Fallows' first task was the selection of a site for the observatory. His final choice rested on a piece of land between Liesbeck River and Salt River, on a rocky hill known as "Slang-Kop," or Snake Hill. The place now lies in the inner suburbs of Cape Town, and is still the site of the present observatory; but in Fallows' time, it had few charms to commend it. Thistles, snakes, jackals, and thieving natives were only the more common nuisances. A contemporary account tells of a hippopotamus that sank in a marsh near the observatory and was so completely mired that it had to be shot. Sir David Gill, in his *History of the Cape Observatory*, relates an incident that involved Fallows himself. One night the latter was testing the newly installed shutters that he had designed for the meridian instrument. In

Sir David's words: "on pulling the rope to open the shutter for observing zenith stars, he found that the shutter would not move. He ran up the staircase leading to the roof, peeped out of the door at the top, and there, comfortably seated on the central trap door of the meridian opening, was a large leopard (the so-called Cape Tiger). The astronomer and the leopard both rapidly disappeared in different directions."

Fallows' difficulties in creating an observatory were not limited to those provided by Nature. He had had little experience in dealing with administrative matters,

and his retiring nature deprived him of the leadership necessary in the handling of his personnel.

For some unknown reason, the construction of the observatory building was delayed by the Admiralty until 1825. In the meantime, Fallows erected a temporary instrument in a wooden hut, such as those being used by settlers. Government parsimony further

delayed the completion of the buildings, and it was not until the end of 1828 that the piers for the telescope were erected. Observations with the permanent instruments were begun at once. By November, 1829, some two thousand meridian observations were transmitted to the Admiralty.

Reductions of the measurements were greatly hampered by the lack of suitable assistance, and it seems that Fallows had some difficulty in hiring and retaining able personnel. Even Mrs. Fallows had to lend a hand whenever observations required the simultaneous action of two people.

In the fall of 1830, a serious epidemic of scarlet fever affected nearly everyone on the staff. Fallows never recovered completely, and he died a few months later at the age of forty-three.

His successor, Thomas Henderson, who was said to be a brilliant man, unfortunately felt an intense dislike for the place, and resigned a year after his appointment. After his return to Great Britain, however, he took great pains to reduce and discuss all his observations. He is credited with the first discovery of the parallax of a fixed star.

The year 1834 saw the arrival at the Cape, within ten days of each other, of Sir Thomas Maclear, the new director of the Royal Observatory, and of Sir John Herschel, who came for four years on a private expedition. John Herschel's purpose was to complete the work on nebulae and star clusters begun by his father, Sir William Herschel, and to extend it to the southern hemisphere. The close friendship and collaboration of Herschel and Maclear gave to the budding Royal Observatory the necessary impetus that would eventually give it a place among the leading observatories of the world.

In the month of February, the (Continued on page 104)

CONQUISTADORS

*As once men ventured all, to know
The lonely, wine-dark ocean's face—
These dare the awful solitude
Of endless, purple space.*

Gladys W. Ekeberg

Nature IN THE SCHOOL

By E. LAURENCE PALMER

Professor Emeritus of Nature and Science Education, Cornell University,
and Director of Nature Education, The American Nature Association

Cells That Divide

ACCORDING TO THE DICTIONARY, *meristem* is embryonic or undifferentiated tissue, the cells of which are capable of active division. Meristematic tissue is a tissue whose cells are in process of rapid division and growth. Primary meristems arise from embryonic undifferentiated substances, while secondary meristems arise from the rejuvenation of cells that may have developed *patterns* of growth which are essentially fixed.

Teachers, parents, civic leaders and "just plain folks" might well consider these definitions, since, for the most part, they deal with social tissues the units of which will, or in part have, established patterns of growth. The important thing is that such tissues have not become completely fixed, and may be changed or directed in part by the nature of their environment. Denied nourishment, they may differ greatly from those supplied with the best possible growth elements. It is well-nigh impossible to direct changes in completely mature tissue, whether it is in a plant or in a society. It is highly rewarding to have the opportunity of working with growing organisms; but influencing growth carries with it immense responsibilities, and it is for this reason that teaching is one of the most rewarding of professions. It is important that such responsibility be recognized at the beginning of a new year—or, for that matter, the beginning of any new period in which growth may be expected. At these times, decisions must be made, whether we like it or not, or we must accept the sometimes unpleasant consequences of our inertia.

An illustration

Within six feet of the desk where this was written, a robin is building its nest. The nest has reached the stage where a lining must be made. The basic material being used is "just plain mud," collected from a place where a short time ago I used

a garden hose to add water to soil. At present, this mud has the fluid properties of the water, and can be moulded into a form to fit the size and shape of the mother robin. When the water has evaporated, the mud will assume the properties of the soil, and provide a firm support for the delicate and infinitely valuable eggs that will start a new generation of robins. In a sense, the mud in its present fluid form is the meristem of the solid bowl that will give stability to a nest that started as a loose collection of debris. If the robin is busy in the next hour or so, the nest will fulfill the function for which it is being built. If the robin waits until the mud has set, matters will become more complicated.

The school experience is essentially one in which meristematic citizens are being developed from what we hope is basically good and substantial material. Whatever that basic material may be, it is the obligation of the teacher to mould from it the best possible behavior pattern for the balance of the students' lives. Let us look at some other meristems, to see how important these stages of flux may be, developed from active elements in the process of growth and certainly not yet completely differentiated. What are some of the *pabulums* we are feeding these growing organisms? Are they the best we can supply?

It is in the borderland between physical and biological science that the most fruitful research may be expected. It is along the borders of field and woodland that we usually find the greatest variety and abundance of wildlife. It is where sun and shade come together that we may expect the best sustained growth of most organisms. It is where the land meets the sea, where fresh water meets salt water, where extremes of heat are moderated by cooler air that life prospers. It is where city meets the country, and where town meets gown, that the ideal existence may be expected.

Similarly, it is where youth meets maturity, where irresponsibility gives way to reasonably disciplined responsibility, that we can do the most good for the future. We must extend that growing period as much as possible, which may be done by making growth a rewarding experience. This is something the teacher must do. This is what makes teaching worthwhile.

Facility of expression

A part of any teacher's responsibility centers around the facility of self-expression. No field of human endeavor is free from this obligation. Where do we learn how to talk? Is it from television programs where one cosmetic beauty tells us we should not have "orangy" complexions, or is from another who tells us that we should be "peachy"? Do we get our patterns of expression from listening to correct English, or from the ignorant or careless? Where do we develop our patterns of art or music, and how can we train youngsters to use good judgment in these fields? Somehow we must find out how to reward literacy—and to penalize illiteracy—in those who are in a position to become leaders in this field. We must even learn how to combine sense and nonsense to really enjoy life to the full.

We must find the happy combination of freedom and discipline. We cannot avoid indefinitely making decisions because of the mere fact that some students do not want to work. How do they know whether they want to work if they try it but seldom? The notion that students should do nothing but what they want to do has, too many times, created impossible situations, and does not warrant general adoption. We must learn how to combine leisure and work, and cannot go through life failing to face crises because they may be temporarily unpleasant.

In many parts of the world, there is evidence that some people, at least, feel that mob rule should be the accepted means of bringing about change. Mob rule has happened in classes of pre-college students as well as among college students. Sometimes it appears in the form of sit-down strikes. At other times, it is in the form of active demonstrations and threats. Times like these call for cool heads among those who are "calling the shots." Resentments are often contagious, and in an orderly school, community, na-

tion or world they must be resolved by reason, rather than by force, unless we wish to face chaos, or a situation in which our fate will be dictated by others.

Democracy calls for the existence of embryonic tissue, or some undifferentiated tissue in which the entities are capable of active growth, and whose patterns of behavior may be evolved by a combination of the experienced and inexperienced component parts. It may be helpful to read again the dictionary's definition of meristem, to see if, in it, we cannot find some way out of our difficulties. In a plant, meristematic tissue is necessary for growth, but it derives the elements needed for growth and development from the relatively mature parts of the plant.

Outdoor Film

Mr. Warne L. Clarke, Director of Instructional Materials of Snohomish, Washington, County Schools, has announced the availability of a 28-minute moving picture in 16-mm. color and sound that may be used in elementary science, Nature study, northwest geography and history, biology, and conservation. The film is designed to acquaint children and adults with Snohomish County's outdoor education program, and was filmed at Camp Silverton in the Cascades wilderness area. The selling price is \$200, and the film is available on a preview basis. Further information may be obtained from Mr. Clarke at the Office of County Superintendent of Schools, Snohomish County, Everett, Washington.

Don't Be One

The Outdoor Writers of Ohio have begun a campaign to impress upon hunters and fishermen the necessity for cooperation in the anti-litter campaign, notes *The Buckeye*, news letter of the Ohio Division of Parks. During the campaign, the word "strewball" was coined by Al Simmons, a Cleveland outdoor writer, while, in a contest sponsored by the *Cleveland Press*, the word "scatterpillar" was adjudged a good one for outdoor enthusiasts to keep in mind.

Transition Reptiles

Four nearly complete skeletons of mammal-like reptiles that are believed to represent a transition stage between two major divisions of the animal kingdom recently have been

added to Smithsonian Institution collections. They were collected by Dr. G. Edward Lewis, U. S. Geological Survey, and Dr. D. H. Dunkle, associate curator of vertebrate paleontology of the Smithsonian Institution, on the Western Navajo Indian Reservation in Arizona. They are probably the most complete remains yet found anywhere of a group of land-dwelling, four-legged, cold-blooded animals, the *ictosaurs*. They were reptiles, but with certain anatomical features so close to those of the earliest known mammals and of present-day marsupials that they sometimes have been classified mistakenly as mammals. They were found imbedded in rock of late Triassic or early Jurassic age, and thus were contemporaries of the early dinosaurs and probably of some of the most primitive mammals. They approached closely, Dr. Dunkle points out, to the mammal type of body structure, being creatures about the size of a cocker spaniel, with incisor teeth somewhat similar to those of present-day rodents and cheek teeth with three rows of cusps on each tooth.

Bulletins

"Learning About Soil and Water Conservation," by Adrian Fox and George Rotter, is a text-workbook intended as an instructional tool in soil and water conservation for elementary and junior high school pupils. Included in this suite of materials is a teacher's manual for using the text-workbook, which contains a diversity of conservation experiences for both city and rural children, and many pictorial lessons in the wise use of natural resources. The text-workbook is available from the Johnsen Publishing Company, 1135-37 R Street, Lincoln 8, Nebraska, and an examination copy may be obtained from the firm at the pre-publication price of seventy-five cents.

"Materials for Teaching Conservation and Resource-Use," a publication of the National Association of Biology Teachers and published by Interstate Printers and Publishers, Inc., of Danville, Illinois, is a 55-page bulletin that lists sources of free and inexpensive conservation education materials for the classroom from State and national agencies, selected references, and films and film strips. It is available from the publisher for thirty-five cents.



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THE Nature CAMERA

By EDNA HOFFMAN EVANS

Challenge of Texture

THE MORE WE KNOW ABOUT A SUBJECT, the more we want to know. Some subjects may be learned completely, others never cease to open new phases to be investigated and techniques to be mastered.

Many of us like a subject as long as it challenges us. When it becomes routine, with nothing new to offer, we get tired of it and go off in search of other and more challenging fields.

Often, as we delve deeper, we set up new problems for ourselves. We want to deal with more complex phases, we set up higher standards, and we become much more exacting in what we consider to be good.

We photographers like challenge. Think back, if you have been taking pictures for more than two or three years. Are your present photographic interests the same as they were when you clicked your shutter for the first time? Do you accept as "good" the same sort of picture that you accepted then?

In the beginning, you probably thought any picture was good if you could recognize the people or the objects in it. Then you began to notice that some pictures were better

Note the texture in this weather-worn wood. Light from the side, not higher than a 45-degree angle, emphasizes texture.



than others. You began to look for details like the highlight in an animal's eye, or the position of a bird's wings. In landscapes you noticed composition, the play of light and shadow; you saw that some shapes were more satisfying than others.

The little things

The more details you noticed, the more you looked for. You became aware, whether you realized it or not, of little things. You watched for stray blades of grass that might get in the way and cause a blur between the lens and the subject. You noticed distracting things in the background. Maybe you did not always notice them in time to remove them, but when the pictures were printed you saw them!

You became aware of light. You began to notice *how* it fell on the subject, and the direction from which it came. You realized that back-lighting—light that came from behind your subject—made your subject stand out from its surroundings much more distinctly. You realized also that straight, head-on light gave a flat result; there was no modeling in the shadows, nothing to give your picture depth.

You found that you did not need to take pictures of big or impressive things. Instead, you discovered that little things were much more challenging. In capturing simple subjects on film you had to watch for texture. You took delight in getting the sheen on an animal's coat, the feather pattern of a bird's wing as it moved in flight, the texture of a flower petal as the light fell on it, and then as the light shone through it from some source behind.

You found that you could sit for long minutes, even hours, and wait until the light was just right. Your non-photographic friends thought you were slightly crazy, but you knew what you were doing and you took pleasure in it. In your own way you were becoming an artist, even though you never hoped to scale the heights of fame and fortune that some artists attain. You were

satisfying some creative, artistic urge inside, and you were a better person for it.

Texture is intriguing

Texture is an intriguing, challenging, elusive thing. Think of all the textures there are: the texture of flower petals—roses and skunk cabbage blossoms; the texture of hair—a squirrel's fur or the shaggy winter coat of a collie; the texture of leaves—the fronds of a fern or the rapier-like spears of a Spanish bayonet; the texture of earth—cracked, dried mud or wind ripples in fine sand; the texture of tree bark—oak, pine, birch, or eucalyptus. We could go on indefinitely, searching for and finding interesting contrasts.

How does one bring out these textures? What does he do, camera-wise, to use them to the best advantage?



It is not always possible to control light direction in photographing trees. The rough bark on this juniper shows its texture regardless of light direction.

Generally speaking, surface texture is revealed by side lighting and obliterated by frontal lighting. The greatest emphasis is given by a light that strikes the surface at such an acute angle that it just skims over the top. As a result, even the smallest surface projection is brilliantly illuminated on one side and casts exaggerated shadows on the other. This extreme effect is good with some materials and undesirable with others. Using fabrics as an example, such hard, low lighting would be quite suitable for a piece of canvas, but it would make a piece of velvet look bristly and stiff rather than soft and pliable.



Note how front lighting emphasizes only the top surface of these cholla skeletons and gives no depth to the background.

The following are some lighting techniques that have been found effective in bringing out texture.

Translucent subjects (materials that, while not transparent, allow light to disperse through them) such as flesh, hair, flower petals, and leaves are best revealed by back-lighting, so that the light rays travel from them toward the camera. Front lighting destroys this texture and makes the subject look flat and lifeless.

Photographing wood

Wood patterns. Treatment here depends on the surface of the wood. If the wood is highly polished, normal lighting for modeling will do

Sand patterns are best when the light comes from a low angle—morning or evening. These ridges are not high, but notice how the shadows emphasize them.



the trick, with the addition of a color filter to bring out the grain. This filter, however, should never be deeper in color than the palest tints of the wood.

Tree bark, and rough, unfinished wood surfaces are best revealed by side lighting. Very rough bark is best emphasized by a low angle of light, while smoother surfaces are better revealed by a higher angle. In photographing trees in Nature, complete control of light is not always possible. However, by choosing the time of day, and searching for the best camera angle, good textural effects may often be obtained.

Seascapes. A medium or deep yellow filter will help improve the tone rendering of both sea and sky. If only the water surface is desired, put the camera on a tripod and stop the lens down to give depth of field. If you can get some distance above the surface—on a dock or pier—on a day when the swells are long and oily, you can take an excellent picture of water texture and obtain an almost seasickness-producing effect.

Sand. In areas where the sand drifts into dunes, you will find wind patterns that are photographically fascinating. Plan to take your pictures early in the morning or near sunset in the evening. In that way your shadows will be long and sharp. At mid-day the surface flattens out, because there are no shadows.

HUMOROUS RELEASES

Sometimes I get a chuckle out of the press releases dealing with photography that come to me in the natural course of events. I chuckle, and at the same time I feel great respect for the ingenuity and enterprise that dreamed them up. A recent release from Bell & Howell is a case in point.

It seems that B & H engineers are staging a test to see how long the electric eye mechanism of the company's movie cameras will last. When the test was in its tenth month, they announced that on the basis of normal use, the eye had already survived for a matter of at least 3,750 years—or until the year 5708 A.D. The test keeps the electric eye mechanism operating around the clock, adjusting the camera lens openings 15,000 times a day.

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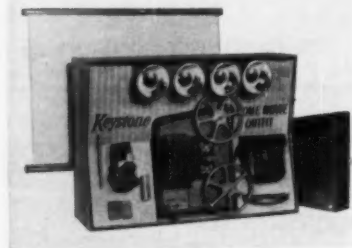
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eras used, B&H engineers have felt it safe to predict that the cameras can continue to operate perfectly for at least three more years of 24-hours-a-day testing. In actual operation time, this means that the cameras could still be taking accurately exposed movies beyond the 175th century A.D. Would it not have been interesting if, in making their predictions, the engineers had also hazarded a guess as to what the subjects would look like in that far distant year of 17,500 A.D.?

THE PACKAGE DEAL

For movie fans who like a package deal, the Keystone Camera Company, Hallett Square, Boston, Mass., has three new outfits, each in a ready-to-take-home carton.

The first, Keystone's model CP-3, includes a new Keystone K20 camera with $f/2.3$ fixed focus lens, a new K60 500-watt projector, Electric Eye light meter, leather camera case, light bar and four lamps, extra reel



Attractively packaged and ready to take home is this Keystone home movie outfit. This is the CP-4, which includes the K26 movie camera with three lenses and built in "A" filter, projector, light meter, camera case, light bar with four lamps, extra reel and can, movie scene record book, quick-splice kit, and screen.

and can, movie scene record book, quick-splice kit, and Radiant screen. The package is priced at \$119.95.

The second, the Keystone CP-4 outfit, contains the company's new K26 turret movie camera with three lenses and a built in "A" filter, along with the projector and other accessories. Price of this second kit is \$159.50.

Between the two is the CP-1 outfit, priced at \$129.95, which contains the K25 camera with an $f/2.3$ lens and other accessories. Any one of these kits will start a home movie maker off in fine style.

For other information about Keystone movie cameras, including the

newly-developed KA-3, which features electric eye lens adjustment, write the Keystone Company.

It looks as though the electric eye has arrived in photography—both movie and still—and it is here to stay.



Early Days

(Continued from page 99)

New Moon will occur on February 7, and the moon will be full on February 23.

Mercury, a morning star during the first half of that month, will be too close to the sun for observation. It will enter the evening sky on February 14. By February 28, it will set in the west one hour after the sun, and will still be hard to see.

Venus, low in the southwest at dark, will be an evening star all month, setting at about 7:30 p.m. on February 1, 7:45 p.m. on February 15, 8 p.m. on February 28. Its magnitude will be a bright -3.4 .

Mars, in Taurus, will be found due south of the Pleiades at the beginning of February. Overhead at dark, it will set at 2 a.m. on February 1, 1:45 a.m. on February 15, 1:30 a.m. on February 28, by which date it will have moved to the north of Aldebaran. It will fade gradually from magnitude $+0.3$ to $+0.8$.

Jupiter, in Libra, will be located northwest of Antares. It will rise in the southeast at about 2:15 a.m. on February 1, 1:30 a.m. on February 15, 12:45 a.m. on February 28, and will be low in the south at sunrise. Its magnitude will brighten slightly from -1.5 to -1.7 .

Saturn, in Sagittarius, will rise in the southeast at 4:45 a.m. on February 1, 4 a.m. on February 15, 3:15 a.m. on February 28, and will be still low over the southeastern horizon by sunrise.



Sea Shell Game

Latest addition to the Nature card games brought out by Nature Games, San Martin, California, is entitled "Sea Shell Aristocrats." It has been prepared by Dr. A. Gordon Melvin, with the artistic collaboration of Jean Colton. As with other games in this group, it instructs as it entertains. The objective of the game is to assemble families in the course of the play. These games sell for \$1.35 each, or all seven Nature games in the series for \$8.50.

National Forestry School

The increasing demands of various segments of America's conservation programs—forestry, wildlife management, soil and water, fisheries, and other branches—have caused a serious deficiency in available numbers of trained technicians. The National School of Forestry and Conservation, with school field headquarters at Wolf Springs Forest, Minong, Wisconsin, has been organized to provide a technical extension course for training conservation technicians, and offers courses in soil and water conservation, fish and wildlife conservation, and forestry. Lessons are designed for both workers already in the field, and for young people who would like careers with forestry, wildlife, and State and national agencies; and an extension school field office will be maintained in Washington, D. C. Inquiries about the offered courses may be directed to the School field headquarters at Minong, Wisconsin.

Watershed Congress

The Statler Hotel in Washington, D. C., will be the site of the sixth annual meeting of the National Watershed Congress, which represents more than twenty major agricultural, business, civic and conservation organizations in fostering public understanding and participation in a national program to control water run-off and soil erosion. As in the past, this annual meeting, scheduled for May 25-27, will be open to all interested persons, and it is expected that many members of Congress, leading natural resources administrators and soil and water conservation experts will attend. An essential part of the program will be a review of progress in watershed development, and an evaluation of factors that will influence the program in coming years.

Historic Garden Week

The Garden Club of Virginia, which annually sponsors a "Historic Garden Week in Virginia" during which private homes and gardens, historical and modern, are open to visitors, has announced that the twenty-sixth such event will be held from April 18 through April 25 this year. The Garden Club of Virginia uses the proceeds from modest admission fees for the restoration of grounds and gardens of historic shrines of national importance in Virginia.

Endangered Species

The California Fish and Game Commission has recently approved a Department of Fish and Game proposal to rescue the rare Eagle Lake trout of Lassen County's Eagle Lake from threatened extinction. This species, which spawns only in a single stream, has been endangered by water use, climatic changes, and the interference of man, and the population has diminished to an insignificant number, says the Department. An attempt will be made to propagate the fish artificially.

Forest Land Chart

"What We Get from Forest Land" is the title of a large chart recently released by the U. S. Forest Service, Washington 25, D. C. In color, this emphasizes the multiple-use principle of the management of forest lands. Single copies are now available to teachers on request. Additional copies are obtainable from the Superintendent of Documents, Government Printing Office, Washington 25, D. C., at 20 cents each. A quarter-size black and white version of the chart is also available to teachers.

Protection for Bristlecones

The Department of Agriculture, through the U. S. Forest Service, recently has designated 27,000 acres of California's Inyo National Forest as a botanical area in which some 100 bristlecone pine trees more than 4000 years old, as well as many thousands in the range of 3000 to 4000 years, will be preserved. The great age of these trees first became apparent in 1957 as a result of the studies of the late Edmund Shulman and his associate, Mr. M. E. Cooley, who were working on a grant from the National Science Foundation; and a grove of the oldest trees is to be named the Edmund Schulman Memorial Grove in honor of the man who first discovered their true age. The area has been entitled the "Ancient Bristlecone Pine Forest." From the time the antiquity of the trees was first established, it was apparent that immediate protection would be imperative, as the inevitable souvenir-sellers made a quick start in offering limbs and pieces of the old trees. The Forest Service and officials of Inyo County now are collaborating in acquiring parcels of privately held land within the Forest in order to incorporate them into the botanical area.

Bulletins

"State Park Statistics—1957," published in June, 1958 and available from the Division of Recreation Resource Planning of the National Park Service, Washington 25, D. C., is a tabulation of State park expenditures, sources of funds, attendance, areas and acreages, personnel, and anticipated expenditures for 1958, the data having been gathered by the National Park Service from questionnaires circulated among the many State agencies that are involved.

"White Pine Weevil" is the title of Forest Pest Leaflet 21 of the U. S. Forest Service, an illustrated leaflet briefly discussing the life history and control of the most serious insect pest of the white pine country. Five cents, from the Superintendent of Documents, Washington 25, D. C.

"Annual Report of The Nature Conservancy," a record of the annual membership meeting and symposium at Stanford University in August, 1957, contains the reports of The Nature Conservancy's officers for the year, and five addresses given at the symposium, whose theme was *Preserving Natural Conditions in a World of Technological Dominance*. A copy is available on request from The Nature Conservancy, 4200 22nd Street N. E., Washington 18, D. C.

"The 1957 Annual Report of the Girl Scouts of the United States of America," whose title is self-explanatory, and which is a House document of the Eighty-fifth Congress, may be secured from the Superintendent of Documents, Washington 25, D. C., for thirty-five cents. This volume lists the officers, board of directors, committees, the national advisory council, the financial report, and national and regional facts and figures concerning the Girl Scouts of America, for 1957.

"Tree Planters' Notes" for June, 1958, a publication of the U. S. Forest Service for nurserymen and planters of forests and shelterbelts, is devoted to the subject of field planting, with illustrated articles on better tree survival, tree planting machines, spacing aids, direct seeding, seedling storage bins, and other information of interest to those engaged in, or contemplating, reforestation. A copy of this 36-page pamphlet may be requested from the Chief, U. S. Forest Service, Washington 25, D. C.

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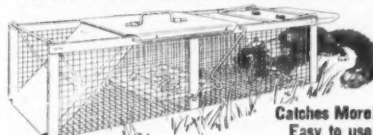
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Nature IN ROCK AND MINERAL

By PAUL MASON TILDEN

The King of Metals

THERE WAS A PERIOD A FEW years ago when newspaper stories had this country fairly well launched into the bright new Age of Light Metals. Elements like aluminum and magnesium seemed about ready—on paper, at least—to displace iron and its alloy, steel, from their time-honored positions in the American way of life.

Last year, and for some years past, American furnaces have poured out some hundred million tons—two hundred billion pounds—of the basic metal. Perhaps the ironmasters have been too busy making iron to read about the threat of the brash new metals! At any rate, we are still in the Iron Age.

Modern America is accustomed to an endless supply of iron and steel. Iron ore—mostly hematite, the sesquioxide of the element—has, since the discovery of the great ore beds of the Mesabi, Cuyuna and Vermilion iron ranges of Minnesota, been given to us almost for the taking. The finished metal, too, has been discarded just as lightly, as a visit to any municipal dump will make evident. But this easy-come-easy-go condition has not always prevailed. At the time that "civilization" was confined pretty much to the eastern seaboard of America, iron was a much more highly prized commodity, and harder to "come by."

Towns are born

In earlier days, many towns sprang to life around a local supply of bog hematite, or sometimes vein magnetite; a nearby source of limestone, and a forest that would supply plenty of charcoal. The names of towns are sometimes clues to their pasts, and town names that include the words "Furnace," "Forge," or "Iron Works" are not uncommon in the East.

The old furnace shown on this page was built not many years after the end of the American Revolution—about the year 1804. It is nestled in a valley on the west side of the White Mountains of New Hampshire, beside the swift-running Gale River, and for many years it pro-

duced castings, forgings and bar iron that was used throughout New England. This was the Franconia Furnace.

It is instructive and amusing to pick through some of the records of this relic of earlier days. The furnace itself was patterned after a French design of the times. It was twenty feet in diameter at the base, and thirty-five feet high, built of hewn gneissic granite slabs that even today have an almost monolithic solidarity.

A charge for the furnace was 15 bushels of charcoal, 250 pounds of magnetite from a nearby vein, and one box of limestone. A day's production of pig iron was two and a half tons, and, over the course of a year, the Franconia Furnace consumed from 200 to 300 thousand bushels of charcoal.

The raw materials

Hard-wood charcoal cost the proprietors \$4 per hundred bushels, while soft-wood charcoal cost \$2.50 for the same amount. The limestone cost a dollar a ton. The total amount paid to a half-hundred workmen for three-quarters of a year's work, in 1838, was \$2297, which worked out to about \$46 each, about the price of a second-hand television set today. We must remember, however, that many of these employees were idle farm hands, and this was really "extra money" during slack times on the farm.

The master iron founder was paid three dollars a day, and the company firmly believed that he was overpaid by two dollars. An entry in the books notes, "Grog allowed 16 workmen per day, \$1.50," and we must guess that the Gale River slaked the thirsts of the lower-ranking employees. The miners who furnished the magnetite received fifty cents a day.

The company advertised "a supply of steel of superior quality, both blistered and spring, which we offer to the public at a reasonable price for cash and most kinds of country produce," and it turned out vast quantities of sledge and carriage ironware, chains, andirons, farm



The forest has closed in around a blast furnace of earlier days.

tools and "hollowware"—the old black iron kettles that are still a familiar sight in parts of New England, the larger of which were known as "farmer's boilers."

With the discovery of western iron ore, the Franconia Furnace and many other furnaces like it banked their fires and closed their doors. Iron-making was moving west.

MYSTERIOUS OBJECTS

Have you a tektite or two in your mineral collection? If so, have you any ideas as to how your queer, glassy specimen originated? If your tektite specimens puzzle you, just remember that they puzzle everyone else, too. Many scientific studies have been made of these objects, but to borrow a phrase from a well-known TV program, the scientists can so far honestly say that they "have come up with nothing." The August *Bulletin* of the Chicago Museum of Natural History has an instructive article by Albert W. Forslev, associate curator of mineralogy and petrology, describing these mysterious objects and several of the theories that try to account for their presence on the earth's surface. This is non-technical and makes good and interesting reading. The Museum's address is Roosevelt Road and Lake Shore Drive, Chicago 5, Illinois.

BOOK REVIEW

Aluminum—

The Miracle Metal

By C.B. Colby. New York. 1958. Coward-McCann, Inc. 48 pages. Illustrated. \$2.00.

This is a non-technical and profusely illustrated account of the

history, processing, and uses of aluminum metal. From the amateur mineralogist's point of view, perhaps the most fascinating thing about the element aluminum is that there exists such an enormous amount of it in the crust of the earth, and yet so relatively little can be recovered economically—a point not touched on in this volume. However, here you can follow the metal through the mill, from bauxite to barrels and all the myriad items made from element number 13. ♀ ♀ ♀

Ice Age Park?

The Advisory Board on National Parks, Historic Sites, Buildings and Monuments has recently submitted to Secretary of the Interior Fred A. Seaton a recommendation that the Park Service investigate the possibility of bringing into the park system a type area of glacial deposits of the last ice age. Representatives of the Park Service, the Forest Service, and the Wisconsin Conservation Department have reconnoitered the Wisconsin moraine region recently, looking toward the possible establishment of a Moraine National Park. The Advisory Board also has recommended that the Missouri Buttes, and intervening land, be added to Devils Tower National Monument in Wyoming as worthy of preservation in the park system because of their "unusual and scientific qualities."

Gila Monster Study

The University of Arizona has recently received a \$12,000 grant from the National Science Foundation for the study of the gila monster of the Southwest. The study, to be conducted by the University's department of zoology, began during the past summer and will continue for a period of three years. Dr. R. A. McCauley, president of the University, says that "there is evidence that the gila monster may be a unique animal which occupies an important position in the animal kingdom. . . ."

New "River"

A new "river in the sea," 250 miles wide and 1000 feet deep, has been mapped by scientists of the University of California's Scripps Institution of Oceanography and the U. S. Fish and Wildlife Service's Pacific Oceanic Fishery Investigations. Unlike the well-known sur-

face currents that appear on maps of the oceans, this is a subsurface current. Measurements show that it is as strong as a thousand Mississippi Rivers and as swift as the Gulf Stream. It flows eastward along the equator for at least 3500 miles.

Hefty Humerus

A lumber yard owner of Delta, Colorado, Mr. D. E. Jones, has recently presented the Smithsonian Institution of Washington, D. C., with the fossilized upper forelimb bone of *Brachiosaurus*, a late Jurassic reptile whose living bulk has been estimated by the Institution's Dr. Peter P. Vaughn at some 55 tons, making *Brachiosaurus* among the largest land animals that ever lived. The donated humerus, from Colorado's Montrose County, is seven feet, one inch long, and is from an animal that almost certainly was a swamp dweller, according to Dr. Vaughn, who noted that even giant bones like these could not support such a body without the buoying effect of water. An examination of the teeth clearly show that *Brachiosaurus* was strictly a vegetarian, said Dr. Vaughn.

The Billionth Dollar

During the middle of last November, the billionth dollar of Federal revenue from sale or lease of national forest resources was deposited in the United States Treasury. This sum represents the gross income from the national forest system since the Forest Service was established in 1905, according to Secretary of Agriculture Ezra Taft Benson. About 86 percent of the billion dollars came from sale of timber, 11 percent from grazing fees, and three percent from water power and land uses, Mr. Benson said.

Hall of Forests

Ten years in preparation, the Hall of North American Forests at the American Museum of Natural History in New York was dedicated last May 13. This remarkable exhibit presents a vivid panorama of the forests of this continent, showing them as a biotic community. Twelve life-sized, three-dimensional exhibits are notable examples of artistry and scientific accuracy, not only presenting the forest scene but the animal and plant communities that are found in each area that is represented.

Wildlife Refuge Use

The year 1957 set a new record for public use of national wildlife refuges, according to the Wildlife Management Institute, of Washington, D.C. More than eight and a half million persons, of whom almost a third were attracted by fishing opportunities, visited the refuges for recreational purposes—an increase of nearly 15 percent over the previous year. Wildlife observers, picnickers, swimmers, and photographers accounted for most of the balance of visitation. At the top of the list were the Upper Mississippi River Refuge in Illinois and Minnesota, Crab Orchard Refuge in southern Illinois, and the Wichita Mountains Refuge in southwestern Oklahoma.

Duck Stamp Sales

Federal "duck stamp" sales for fiscal year 1958 totalled 2,355,353, according to figures that have been made public by Assistant Secretary of the Interior Ross Leffler. This was an increase over the previous year's sales, but was somewhat less than the number sold in 1956, the record sales year. Of the above total, some ten and a half thousand stamps were sold to collectors. Hitherto priced at \$2.00, the stamps will cost \$3.00 each beginning with the 1959-60 series, the proceeds helping to finance the Government's waterfowl refuge and law enforcement programs.

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After You, Sir

Chivalrous birds are the manakins. They are close and highly colorful kin of the northern flycatchers and abound on Barro Colorado Island, the Smithsonian Institution's tropical wildlife preserve in the Canal Zone.

They are perhaps most notable for their courtship behavior, says Dr. Martin H. Moynihan, resident naturalist of the rain-forest sanctuary in the middle of Gatun Lake. Strange indeed is that of one species. Just at the start of the breeding season two males perch together on a branch and start courtship displays. First one shows his fine plumage. Then he respectfully withdraws while the other shows off his finery for a few minutes. Then the second mate-seeker withdraws while the first resumes his performance.

This interchange may go on for hours. At first the birds have no audience. Eventually, however, a female—never more than one at a time—appears, and perches on a nearby branch. Throughout their displays both males have made appealing calls to attract her.

The alternating performances continue. The female watches critically. Finally, for reasons not understood, she selects one of the actors and flies off with him to establish a new family in the jungle depths. Never, it appears, is there the slightest fighting between the two males. They depend on their merits as "actors" only, and never question the judgment of the critical female.

Realistic Projector

With the inauguration of its new Korkosz projector, the Charles Hayden Planetarium of the Boston Museum of Science now boasts a planetarium sky that the experts call the "most realistic yet devised by man," says Bradford Washburn, director of the Museum. The revolutionary new projector, brain child of Frank D. and John J. Korkosz, uses varying light intensities to control brightness of the stars, which are correct to one-tenth of a magnitude, and which even exhibit the familiar "twinkle." The new three-ton instrument projects more than 9500 stars on the 60-foot dome above the spectators, and the Planetarium, in Science Park, Boston, Massachusetts, gives sixteen weekly public shows (with a seating capacity of 276 persons per show) Tuesdays through Sundays.

Primitive Art

As a result of research work done recently by Mr. Selwyn Dewdney of London, Ontario, it may be possible to determine the age, significance and inscribers of the strange primitive paintings, or pictographs, of the Quetico-Superior Wilderness Area both in Canada and the United States, according to the President's Quetico-Superior Committee. Mr. Dewdney already has traveled many hundreds of miles by foot, canoe, motor boat and airplane in his visits to eleven pictograph cliff-sites. The pigments used in these pictographs consisted of a mixture of fish oil and iron oxide, and the drawings themselves are thought to be the first attempts of a primitive people to graphically record their exploits and ideas.

Water Problems

The mythical community of Midvale suffered first from a serious drought, and later from the ravages of flood waters; but these community problems finally were solved by the small watershed approach, with farm and city people, adults and students participating. That is the story told by the four-color, cartoon-type presentation of 16 pages that recently has been released by the Soil Conservation Society of America, 838 Fifth Avenue, Des Moines 14, Iowa. "The cartoon-type presentation is the 'sugar-coated pill' we are using to inform the public about the necessity for upstream methods of water management and control," says J. S. Russell, president of the Society and farm editor of the Des Moines *Register and Tribune*. Information about the availability of the booklet, a list of guiding principles, and suggestions that may help teachers in grades 1 to 6—for which the booklet is probably most suitable—may be obtained from the Society.

Bulletins

"What is Your Stake in the Northern Cascades?" is a superbly illustrated publication of the Sierra Club, 1050 Mills Tower, San Francisco 4, California, that forcefully brings to attention the desirability of preserving intact the wilderness of the Lake Chelan-Glacier Peak area of Washington's Cascade Range. (Twenty years ago, a National Park committee judged the area to be "unquestionably of national park caliber"). With a map of the

present limited area, the limited area as recently proposed by the Forest Service, and the area that the Sierra Club believes should be preserved from any kind of encroachment or development.

"Selection of Lumber" is Farmers' Bulletin 1756 of the U. S. Department of Agriculture, and is, as the title suggests, an aid to farm and home owners in acquiring the lumber they need for different building and repair purposes, with emphasis on principles of good construction that are often overlooked. This is a 44-page bulletin, well-illustrated, and may be obtained from the Superintendent of Documents, Washington 25, D. C., for twenty cents.

"Wild Flowers of the Sierra," published by the Yosemite Natural History Association, Yosemite National Park, California, presents 22 pages of full-color reproductions of foothill, meadow and valley, and high country flowers of the Sierra. This is a handsome piece of printing. It has been arranged and compiled by Douglass Hubbard, Yosemite's chief park naturalist, and is published in cooperation with the National Park Service as volume 37, number 6 of *Yosemite Nature Notes*.

"Let's Measure Distance, Weight, and Time" is Cornell Rural School Leaflet for Winter, 1958, and is by Verne Rockcastle, who does his customary good job in an informal and interesting discussion, with illustrations, on a subject that touches every civilized person—the science of measurement. A bibliography is included. A copy may be requested from the College of Agriculture, Cornell University, Ithaca, New York, if you live in New York State.

"Natural Regeneration of Loblolly Pine in the South Atlantic Coastal Plain" is Production Research Report 13 of the United States Forest Service, discussing the behavior, seed production, natural regeneration and other aspects of this most important timber tree of the Southeast. Thirty cents, from the Superintendent of Documents, Washington 25, D.C.

"Nature Bulletin" number 22 of the Nature Education Department of Oglebay Institute, Wheeling, West Virginia, is a listing of source materials and supplies for attracting and studying birds, and is available for a self-addressed stamped envelope.

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Nature AND THE MICROSCOPE

By JULIAN D. CORRINGTON

Growth of the Egg

IF THE STUDY OF EMBRYOLOGY IS contemplated, the average person might suppose that work would begin with the fertilization of egg by sperm, which initiates the life of a new individual. But both of these germ cells have a complex architecture, an understanding of which necessitates going back into the parental generation and investigating the formation and growth of the germ cells up to the time of their full maturity. Only when these developmental stages have been completed may egg and sperm unite.

In mammalian embryology the orthodox ovary with which to elucidate this chapter—*ovogenesis* or *oögenesis*—is that of the cat. Specimens are readily obtained without expense and the fixing and sectioning of an entire ovary are simple. Slides may be stained with the regulation hematoxylin and eosin, so the micro-technique involved poses no problems. Comparison of figure 1, a schematized drawing of an ideal section showing all stages in egg development, with figure 2, a photomicrograph of an ordinary routine section, will show that most slides exhibit the majority of stages. It is customary to section the whole ovary lengthwise at ten micra, stain all of the sections and then, under the microscope, select the best ones for retention, discarding the remainder. By "best" in this case is meant those that include a more or less median section through a mature follicle, as indicated at the right end of figure 1.

In the drawing, the developmental cycle begins at the upper left and continues clockwise around the periphery of the ovary, a logical method of presentation. Actually these various stages occur here and there at random, as in figure 2. Inasmuch as the egg cells mature continuously throughout the reproductive life of the cat, a single section will show a sufficient number of the several stages to provide material for a study of the complete cycle.

No exact meaning

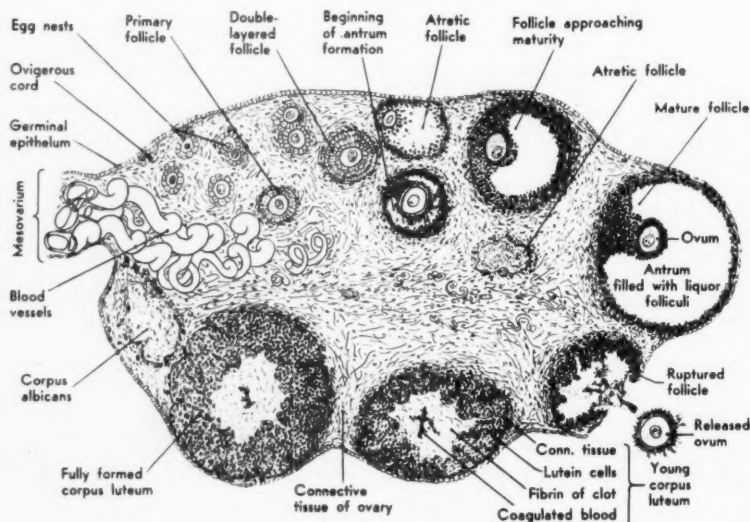
The term "egg," or its Latin equivalent, *ovum* (plural *ova*), is loosely applied to any of the growing series within the ovary, as well as to the fertilized egg (*zygote*) after it has been expelled and is traveling down the oviduct, and assuming it has been penetrated by a sperm cell, and also even to the later cleavage stages. In those animals, as insects and birds, that lay their eggs, the word embraces a number of additive substances, as albumen and shell. Hence "egg" has no exact meaning, and embryologists have had to coin a number of words, based on *ovum*, to indicate definitive stages.

The earliest female sex cell in the series within the ovary is called an *ovogonium* (or *oögonium*) and it develops from the *germinal epithelium*, a single layer of cells making up the outer casing of the ovary. Small masses of cells proliferated from this epithelial layer begin to grow down into the interior tissues of the ovary and constitute *ovigerous cords*, or the

cords or tubes of Pflüger (fig. 1, upper left). These cords then break up into several separate groups, the *egg nests*—rounded balls of cells—in which even this early in the cycle one cell in each nest is seen to be enlarged and surrounded by the others. This is the *ovogonium*, and its sisters are the *follicle cells* (L., a little bag or husk). When they have become organized as a single layer of cells completely enclosing the central "egg," the structure is termed the *primary follicle*. The *ovogonium* now proceeds to grow to its full size, which is many times that of one of its companion follicle cells. As sizes go in the realm of cells it becomes large indeed, reaching the point where it is just visible to the unaided eye as a tiny speck. It is then called the *primary ovocyte* (or *oöcyte*). In man the fully developed *ovum* measures 0.14 mm.

Meanwhile, the follicle increases by mitosis more than enough to keep up with the growth of the *ovocyte*, becoming double-layered and then many-layered. A cavity, the *antrum*, appears as a slight cleft between the *ovocyte* and its follicle cells, and this slit grows and spreads mightily until at length the whole follicle attains macroscopic dimensions. It has pushed down into the connective tissue *stroma* (interior) of the ovary. The follicle cells now constitute a wall, the *stratum granulosum*, surrounding a huge *antrum*, and the

Fig. 1. Schematic diagram of ovary showing sequence of events in origin, growth, and rupture of Graafian follicle and formation and retrogression of corpus luteum. Follow clockwise around ovary, starting at mesovarium. From Patten, Bradley M., *Foundations of Embryology*, McGraw-Hill Book Company, Inc., New York, 1958. By permission.



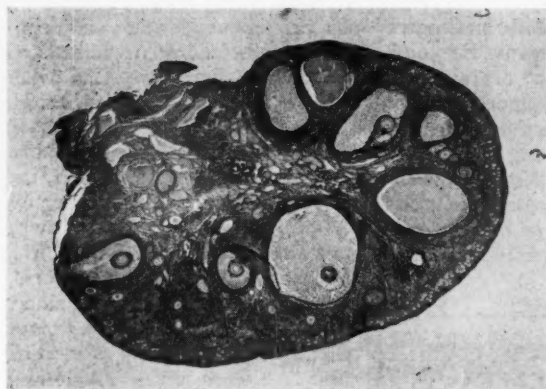


Fig. 2. Photomicrograph of longitudinal section of cat ovary. Most of the structures shown in figure 1 appear scattered irregularly. X34.



(PHOTOMICROGRAPHS COURTESY OF WARD'S NATURAL SCIENCE ESTABLISHMENT)

Fig. 3. Enlarged view of portion of figure 2. Egg nests above, Graafian follicle in center. Tangential section of follicle at right, corpus luteum at left. X115.

follicle is termed *vesicular* (hollow). Its cells have meanwhile secreted a fluid, the *liquor folliculi*, into the antrum, keeping the vesicle plump and turgid.

Now the stroma of the ovary takes a hand and forms a secondary connective-tissue capsule around the follicle, the *theca folliculi*, with an outer fibrous and an inner vascular layer. The antrum spreads around the originally central ovocyte until at last this cell is sustained only by a narrow isthmus of cells projecting from the stratum granulosum, the *cumulus oöphorus*. In figure 3, the central object is a nearly mature follicle, with the stratum granulosum showing as a dense layer of crowded nuclei of the follicle cells, and outside this the theca folliculi. There is some distortion of shape evident in a flattening of the follicle and position of the ovocyte, due to pressure of adjacent follicles and possibly also a slight crushing in microtoming. The ovocyte, with its clear (vesicular) nucleus is surrounded first by a secreted *zona pellucida* and next by a layer of follicle cells that have elongated at a right angle to the ovocyte surface, projecting away radially, the *corona radiata*. These cells adhere to the ovocyte even after it has been expelled from the follicle, and remain attached for a day or so before finally disintegrating.

Some of the developing follicles, from unknown causes, fail to complete the cycle and begin to degenerate (follicular atresia). They are *atretic follicles*. Those that continue normally are known as *Graafian follicles*, after the Dutch investigator, Reinier de Graaf (1641-1673), who

first described them. While they are maturing, they move slowly toward the outer wall of the ovary and at length protrude sufficiently (fig. 1, mature follicle) so as to appear as blister-like elevations of the ovarian surface. The number maturing at any given time depends on the species of animal; one at a time normally in man, several in such mammals as the cat that give birth to a litter.

Rupture of the swollen follicle with liberation of the ovocyte into the body cavity is termed *ovulation*. The immediate cause of this rupture is not certain, although continued growth plus hormonal factors, discussed later, are certainly factors. In the cat, this breaking of the follicle follows breeding, whereas this is not the case in man and numerous other mammals.

At or about this time, the primary ovocyte undergoes the first of its two meiotic divisions, producing the large *secondary ovocyte* (the "egg"), and the small first polar body. After expulsion, this ovocyte begins its second division, proceeding as far as the metaphase. If fertilized by a sperm in the upper portion of the oviduct (Fallopian tube), this cell then completes the second division and becomes the mature *ovum*, with an attached second polar body; if unfertilized, no further development ensues and the ovocyte soon dies and disintegrates. Its period of viability in man is now believed to be less than a day without the stimulus of fertilization.

Cycle not finished

But we have not finished with the cycle of events in the ovary. A small amount of bleeding from ruptured

vessels occurs at ovulation, and a clot forms to heal the broken wall. Follicle cells of the stratum granulosum multiply and begin to fill in the antrum; blood vessels from the vascular layer of the theca invade this renewed growth and bring in many small cells from the theca; the clot, now central through repair of the ovarian wall, is removed by phagocytosis on the part of white blood corpuscles; and the whole structure thus reorganized from the collapsed follicle following ovulation is a *corpus luteum* (yellow body), so-called because of its yellowish color in man. It is red in the mouse, brown in the sheep, but goes under the same name in all mammals.

The corpus luteum becomes an important organ of internal secretion, well-supplied with blood vessels. If the secondary ovocyte remains unfertilized, this body is doomed to a gradual involution (degeneration). The cells disintegrate and their place is taken by an ingrowth of fibrous connective tissue, the whole then becoming a *corpus albicans* (white body), composed of scar tissue, and ultimately disappearing altogether. If, however, the secondary ovocyte is fertilized and becomes a mature ovum, the corpus luteum increases in size and persists throughout the period of gestation. A degenerating but still fairly large corpus luteum is shown alongside the Graafian follicle in figure 3.

The ovary plays an important role in the rhythmic cycle of reproduction. At the onset of puberty the anterior lobe of the pituitary, the master gland of the body, begins the production of a hormone, *FSH* or

follicle-stimulating hormone, which, circulating in the blood stream, reaches the ovary and stimulates growth and maturity of the organ as a whole, as well as of one (man) or more (cat) follicles. The follicle cells themselves now become an endocrine organ, secreting a hormone, *estradiol*, into the antrum; this fluid was called "liquor folliculi" long before the

modern work on chemical messengers in the body was known. Estradiol is one of a group of organic substances all of which produce similar effects, known collectively as *estrogens*, since they bring about the estrous ("heat") cycles in mammals other than primates and the menstrual cycle in man and his relatives. They cause the growth and maturity

of the reproductive tract and mammary glands, and incite animals to reproduce at a time when an ovum will be available for fertilization.

A second hormone

Aiding FSH is a second hormone from the anterior pituitary, *LH*, the *luteinizing hormone*, which cooperates in bringing about the final growth stages of the Graafian follicle, the maturation divisions of the ovocyte, and ovulation. Then, working alone, *LH* causes the formation and growth of the corpus luteum (whence its name). A third pituitary secretion, *LTH*, the *luteotropic hormone*, now induces the corpus luteum to secrete still another of these complex chemical messengers, and so the corpus luteum itself becomes an endocrine gland. Its product is *progesterone*, the *pregnancy hormone*. This chemical carries on the work, begun by estradiol, of regulating the growth of the uterus, bringing it to a condition suited for implantation of the fertilized ovum. Maintenance of a pregnancy depends in some mammals on the continued flourishing of the corpus luteum and its continual secretion of progesterone, and so the old ovarian follicle still looks after the welfare of its offspring, so to speak. If the corpus luteum is removed surgically, no pregnancy will ensue or, if an embryo is already established, it will promptly abort. In man, this is true only in early stages since, as soon as a placenta is formed, this organ takes on the task of manufacturing hormones to supplant those of both ovary and pituitary.

If the ovocyte is not fertilized, the production of progesterone gradually subsides, along with the decline of the corpus luteum, and a new cycle starts up all over again.

Invaluable Reference

Under publication date of August, 1958, the Society of Systematic Zoology has produced an 88-page pamphlet entitled *Books on Zoology* that would seem to be a vital volume for the files of the zoology student, the professional zoologist, the teacher and the librarian alike. The pamphlet, available without charge to persons of these categories, is an exhaustive compilation of books on the various aspects of zoology listed by subject and by publisher, with an index to authors. Address of the Society of Systematic Zoology is the Department of Zoology, Southern Illinois University, Carbondale, Illinois.

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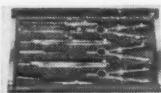
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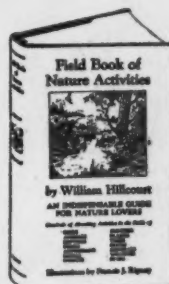
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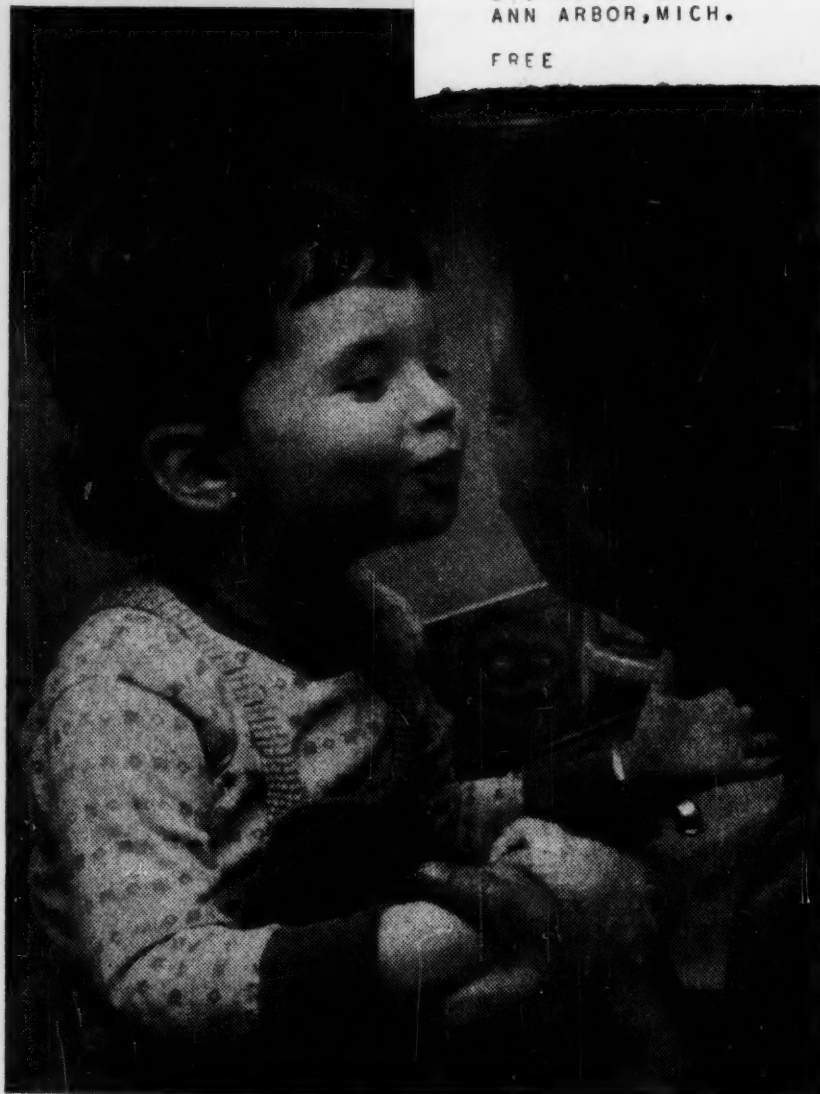
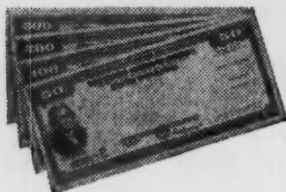
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